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AGRICULTURAL EXPERIMENT STATION
BULLETIN 129

MINNESOTA WEEDS

SERIES I

DESCRIPTIONS AND IDENTIFICATIONS

BY

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MINNESOTA WEEDS

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WEEDS IN GENERAL

DEFINITION

The word weed has been defined in many different ways. A fairly comprehensive definition is the following: "A weed is a plant which grows where it is not wanted;" in other words, "an undesirable plant citizen." A plant may be a weed at one time and useful at some other time, depending upon its environment. For instance, a wheat plant may appear in the cornfield. It is then a weed. Then again one corn plant may be a weed to another corn plant. For instance, if eight plants come up in a hill where only three are desired, five of these plants are really weeds. This, then, is the broad conception of the term weed.

KINDS OF WEEDS

Weeds may be classified in different ways. One of the most useful classifications is based on the length of time the weeds live. This gives three classes: (1) annual, (2) biennial, and (3) perennial.

An annual weed is one that starts from the seed in the spring, develops into a plant which flowers and seeds the same year, and then dies; or, in other words, an annual weed is one that lives but one growing season. Most of our weeds belong to this class. It includes wild mustard, foxtail, wild oats, pigweed, Russian thistle, corn cockle, kinghead, ragweed, and many others.

Some plants are known as winter annuals. Their seeds ripen early in the summer, fall to the ground and germinate, reaching a certain stage of growth before frost. As soon as the frost is out of the ground the next spring, they continue their growth and ripen seeds very early in the spring. Such plants are, in a sense, biennial in their habits, though not real biennials. Some weed examples of winter annuals are French weed, peppergrass, and shepherd's purse. These plants are also annuals, however, just as winter wheat is a winter annual, but, if sown in spring, is an ordinary annual.

NOTE.—In this bulletin the terminology in regard to seeds and fruit is that of the farm and seed trade. For instance, a Canada thistle "seed" is in reality a fruit. Adhering to the strictly accurate botanical terminology leads only to confusion and complexity in a bulletin intended for practical farm use.

The term pod is used in the common sense of a capsular fruit, and not necessarily to designate a legume.

The drawings in this bulletin are all original. The drawings of seedlings were made by E. W. Norcross and G. D. George, those of mature plants by G. D. George, and those of seeds by F. H. Hillman.

A biennial weed is one that lives for two years. The first year it starts from the seed and develops a large tap root below the ground and a rosette of leaves above ground, but does not flower or seed. The large tap root is stored full of food which gives the plant an early start the following spring. From the center of the rosette of leaves a stalk is sent up which bears flowers and, later, seeds. At the end of the second year the plant dies. Two good illustrations of this class of weeds are the bull thistle and the burdock.

A perennial weed is one which can grow year after year without reseeding and is, in most cases, the worst kind of weed to eradicate. A perennial weed is frequently provided with running underground roots, or rootlike stems called root stalks. The root stalks run underground parallel to the surface of the ground and at intervals send up branches which may later on be separated from the main plant and may become independent plants and form flowers and seeds. In some cases, such as the Canada thistle, true roots form underground runners similar in appearance and action to the root stalks. The root stalks of some of the perennial weeds lie near the surface, while in others they are some distance below the surface. The root runners of the Canada thistle and the root stalks of the wild morning glory and the perennial sow thistle are quite deep, while such plants as quack grass and sheep sorrel have their underground stem systems near the surface. Canada thistle has been found to have roots two and one-half feet below the surface of the ground. It can be seen, then, that a perennial weed has two ways of propagating itself: (1) by running underground roots and root stalks, and (2) by seeds in a manner similar to that of the annual weeds.

LOSSES CAUSED BY WEEDS

When growing with crop plants, weeds rob the soil of much food and moisture which should be used by the other plants. For this reason the cultivated plants often become weak, owing to insufficient food and moisture. Weeds are usually hardy and prolific. They will thrive especially well in carefully prepared soil if given the chance. Unless they are kept down by proper cultivation and crop rotation they soon overrun the land.

The cost of eradication of such weeds as quack grass and the Canada thistle is very great. To eradicate quack grass from an acre of badly infested land often costs from fifteen to twenty dollars.

Weeds are not only unsightly on farm lands but greatly reduce the value of the land. Some farms, especially when left in the hands of shiftless renters and owners, become so infested with weeds that the value of the land is reduced ten to twenty dollars per acre. Dock-

age, when the grain is sold, is almost always the result of a large percentage of weed seeds found mixed with the crop seed. A heavy loss in selling the seed is often sustained from this source.

In hay crops weeds are detrimental because they prevent proper curing. Their presence in hay and feed grains is particularly harmful because the seeds may pass through the animals to which they are fed and may be spread on the land when it is manured. Farmers can not be too careful about the kind of hay and grain they use. Hay and feed grains are among the most frequent vehicles in the spread of weeds on farms. New weeds are introduced into localities and old weeds are spread.

When weeds appear in such crops as oats, wheat, barley, and flax the strain on the machinery in harvesting these weeds and the extra cost of twine are no small items of loss. They often attract insects, and may furnish a wintering place for such insects as chinch bugs and grasshoppers. Such fungous diseases as wheat rust live over winter on wild grasses as quack grass and wild barley.

Some weeds are poisonous, as corn cockle, water hemlock, poison ivy, poison sumac, and black night-shade. The corn cockle seed, when fed to chickens and stock in any quantity, may cause death. When ground in wheat it lowers the grade of flour. Bread made from such flour has been known to prove fatal.

Some weeds, like wild barley, which have long awns, often cause painful injuries in the throats and mouths of cattle and horses. Other weeds which have burlike fruits and seeds often cause a great loss in places where sheep are raised. These burs get into the wool, thus causing more expense in preparing it.

HOW WEEDS ARE SCATTERED

One way that weeds get on the farm is by the sowing of impure seed; that is, by sowing seed that has mixed with it the seeds of many of the noxious weeds. This is nearly always due to the ignorance of the person sowing such seed. Good, clean seed should always be sown. The most proficient farmer will sow the very best seed obtainable. If there is any question about its purity, a test should be made so as to ascertain what weed seeds are present.

Many weeds get on the farm by the scattering of manure on the land. It has been found that many weed seeds pass through the digestive organs of stock without injuring their germination power. Weeds can thus be brought onto the farm through hay which is brought from other places.

Weeds are scattered by natural agencies, such as wind, water, and snow. Many seeds have an umbrella-like attachment which

enables them to be carried long distances by the wind. The Canada thistle, bull thistle, milkweed, and many other weeds have such seeds. Then again, in some plants like the Russian thistle, tumbling mustard, and tumbling pigweed, the entire plant breaks away about the time the seeds are mature and tumbles over the ground scattering its seeds in this manner.

Many weed seeds are carried long distances in streams of running water. This is noticeable in low lands when a stream overflows its banks. Along the stream after the overflow many weeds spring up which were never seen there before. Threshing machines and other machinery going from one farm to another or from one part of a farm to another often scatter seeds.

Some of the perennial weeds, like quack grass and the Canada thistle, which have underground stems or running roots, are spread by machinery and horses. They scatter parts of the underground stem or root. A small portion of this stem is capable of producing a new plant, and the greatest care should be exercised to see that none of them are scattered on uninfested lands.

Many weeds, like the burdocks, have barbed fruits or seeds which cling to the fur of animals and to the clothing of man, and are thus carried from one place to another.

A bad weed often gets a strong foothold in a community because its habits are not known. Whenever a new weed appears on the farm, it should be carefully studied and the person finding it should at once become acquainted with it. Such weeds, if not known, should be sent to the Experiment Station for determination.

Thus it can be seen that weeds may be scattered in many different ways. In order to keep down the spread of weeds the following rules should be followed:

Sow only pure seed.
Use well-rotted manure.
Keep weeds from seeding.
Be careful not to spread seeds or the underground stems of perennial weeds.
Learn to know all bad weeds and their seeds.
Practice clean cultivation and crop rotation.

LEARN TO KNOW THE WEEDS

Farmers should study weeds, learn how they grow, when they mature seed, whether they come from the seeds or from roots each year, in what soil they thrive best, and many similar features of weeds. Then the question of eradication would be more easily solved. A weed is most commonly known when it is in flower or in fruit. Very

few persons know weeds when they first come up. This bulletin aims to acquaint persons with weeds in all of their different stages of growth from the seed to the mature plant. Its purpose is to bring to the farmers' attention only a few of the most common weeds of the State.

FIG. 1. Minnesota Weed Seed Case Series I.

It is hoped that the farmer will learn to know them whenever he sees them and in whatever stage. It is planned to publish a series of bulletins gradually extending the field to other weeds of the State. The twenty-four weeds herein described are the weeds whose seeds appear in weed seed case Series I, which has been prepared by the Division of Plant Pathology and Botany.

This case is sold for a nominal sum. A second weed seed case has been prepared containing twenty-four weed seeds, none of which appear in Series I, and a bulletin will be issued describing the twenty-four weeds whose seeds appear in this case.

If the lessons of this bulletin were to be summed up in a few words they are these: Know the weeds, not only in the seed form, but in every other stage and condition. Start with a few of the worst kind and gradually extend your acquaintance. When you know the weeds learn the methods of eradication.

INDIVIDUAL WEEDS

Quack Grass (*Agropyron repens* L. Beauv.)

Other common names.—Couch grass, quitch grass, twitch grass, scutch grass, quick grass, and witch grass.

Description.—Quack grass is a perennial plant with very wide spreading underground stems, commonly but improperly called roots. These underground stems very seldom appear more than six inches below the surface of the ground. At short intervals on the underground stem buds appear which can send up new plants. Any small bud-bearing portion of this underground stem is capable of producing a new plant. The underground stems are generally solid throughout and the roots which come from them are fine and fibrous like those of other grasses. The leaves are of various lengths, ranging from three to twelve inches, and are generally of a grayish green color. They are more or less rough on the upper side and smooth beneath. The flowering head is about four inches long and from a fourth to a half of an inch wide. The head is divided into small sections called spikelets. Each spikelet contains from three to seven seeds when mature. The seeds are not easily shelled out and generally the entire spikelet breaks from the stalk. The seeds are usually somewhat less than half an inch long. They may either be awned or not. The seeds are light brown or yellowish when mature. Quack grass is considered one of the worst weeds in Minnesota.

Quack grass flowers during the latter part of June and ripens its seeds in July. It is propagated by underground stems as well as seeds, and these stems are often scattered on the hoofs of horses or by machinery used in cultivation. The weed grows in many kinds of soil but thrives best in rich soil. It is found in nearly all parts of Minnesota, but most commonly in the southern and western parts of the State. Its seeds occur in wheat, rye, barley, clover, and timothy but still more commonly in brome grass. It is almost impossible to separate the seed from that of brome grass by means of cleaning machinery. Unbroken spikelets are often found in the seed.

Eradication.—Smothering by plowing and thorough bare culture is the best means of eradicating quack grass. The best results will follow when the treatment is given in hot, dry weather after the root

systems have been somewhat exhausted by the growth of plants. The seed should not be allowed to mature, however, or, if mature, the grass should be cut and burned.

Where a field is badly infested, it should be plowed deeply from five to eight or more inches, as soon as the hay or grain crop is removed, preferably by August 1 to 15. The plowing must be well done and all portions of the plants turned completely under. A jointer on the plow will aid in turning the grass under perfectly. The plow should be followed within a very few days by a disc harrow with discs set nearly straight to avoid inverting the sod. The purpose is to fill the spaces between the furrow slices, thus stopping the free circulation of air. Following the first discing the land should be double disced frequently enough to prevent the appearance above the surface of any quack grass leaves. This will be twice a week in warm, moist seasons and once a week when the weather is dryer. The discing should be continued until growth ceases, usually from six to eight weeks. To make sure of eradication it is well to disc occasionally until freezing weather in the fall.

The following spring cultivation should begin early and be continued at intervals of a week or ten days until from May 15 to 25, when the field may be planted thickly to ensilage- or fodder-corn. Thorough cultivation of the corn, with hand hoeing where occasional plants appear in the rows, should complete the eradication, but extreme watchfulness is required to get all of the plants.

The intensive cultivation is expensive and is called for at times when farm labor is extremely busy, but there seems to be no other way to eradicate the weed completely. The cost of cultivation is in many cases returned in the increased yield of the crops following.

Short crop rotations are useful in keeping quack grass under control, and, when arranged so as to provide an opportunity to attack the quack grass at seasonable times, they will permit eradication of the weed without losing the use of the land. A good two-year rotation for this purpose uses ensilage-corn after fall rye. Plow the land after removal of rye, disc, and prepare for ensilage-corn the next year. Plow the land after harvesting the corn and sow to rye immediately. The following three-year rotation may be used: (1) Fall rye or barley seeded to clover; (2) clover hay, first crop; plow between July 15 and August 1, and disc as above; (3) ensilage-corn. A fall rye, corn, barley, and clover rotation may be managed so as to eradicate the quack grass between the first and second years.

Slender Wheat Grass (*Agropyron tenerum* Vasey)

Other common names.—Bunch grass, western wheat grass, or western rye grass.

FIG. 2. Three stages of growth of the *quack grass* seedling (natural size); also enlarged drawing of the seed and spikelet.

FIG. 3. *Quack grass*, showing the entire plant system both above and below the ground (× ¼).

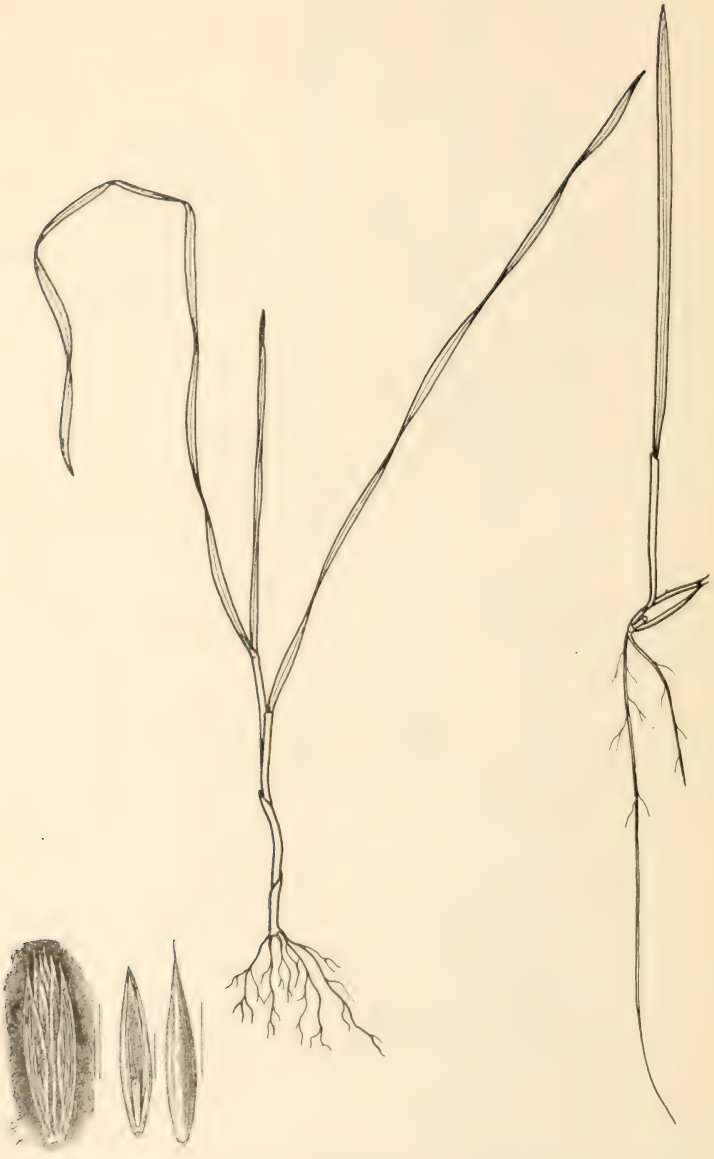

FIG. 4. Two stages of growth of the *slender wheat grass* seedling (natural size); also enlarged drawing of the seed and spikelet.

FIG. 5. *Slender wheat grass* showing root system and single spike ($\times \frac{2}{3}$); plant $\frac{1}{4}$ ($\times \frac{1}{3}$).

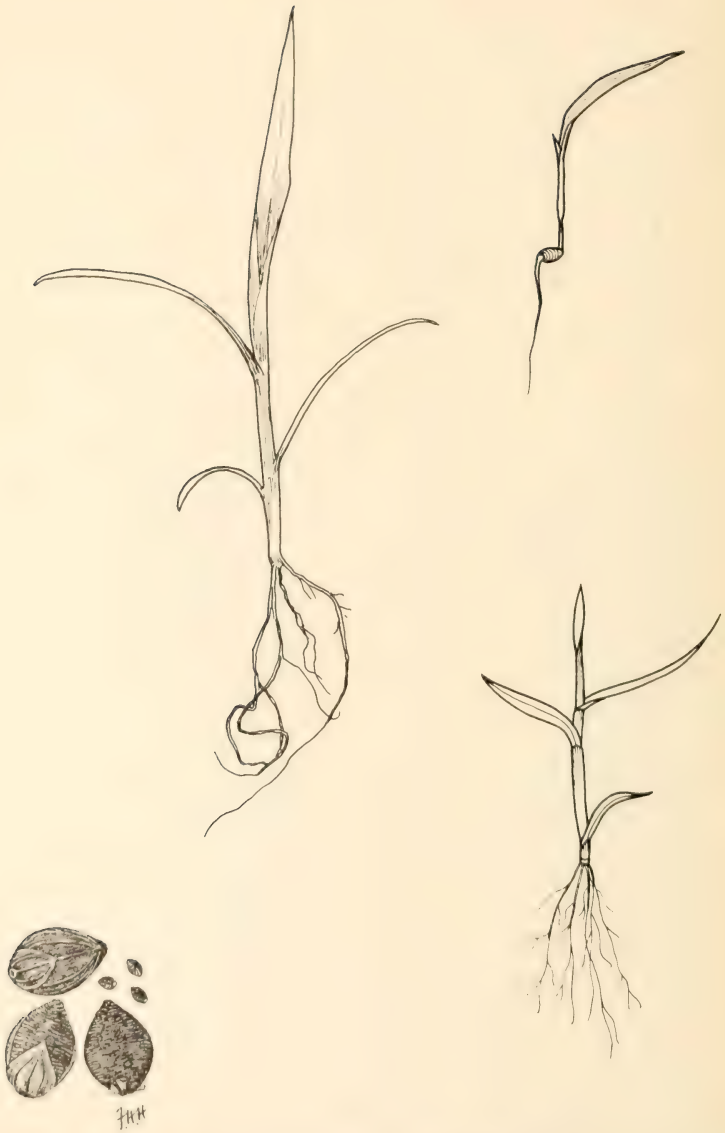

FIG. 6. Three stages of growth of the *yellow foxtail* seedling (natural size); also enlarged and natural sized drawings of the seed.

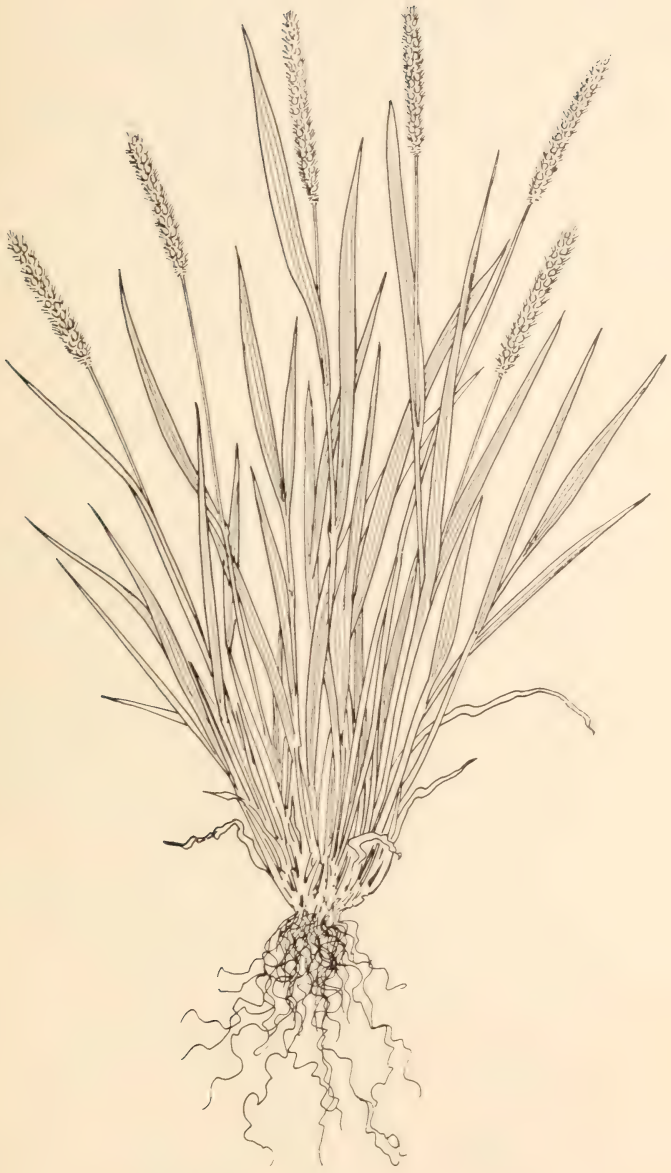

FIG 7. *Yellow foxtail*, entire plant (× ⅓).

Description.—This plant within recent years has been found to be a good forage grass and possibly should not be described as a weed. It is, however, often mistaken for quack grass, so a description of it is given. The seeds are so similar to those of quack grass that it is almost impossible to note any differences between single seeds.

Slender wheat grass is a perennial with fibrous roots. The plant is from two to three feet tall and generally grows in bunches. The leaves are somewhat narrower than those of quack grass. The flowering heads are much longer than the heads of quack grass and somewhat narrower. The head is divided into sections called spikelets, and each spikelet, when mature, has from three to five seeds. These seeds are easily separated. Some of the differences, then, between slender wheat grass and quack grass are:

1. Quack grass has long running root stalks. Slender wheat has a fibrous root system.
2. The flowering head of quack grass is shorter and wider than the head of slender wheat grass.
3. The seeds of slender wheat grass shell out more easily than those of quack grass.
4. Quack grass has more seeds in a spikelet than slender wheat grass.
5. Quack grass is a perennial weed. Slender wheat grass is a perennial forage grass.

The seeds of slender wheat grass ripen early in July and the plant has no other method of propagation. It is found in dry soil in nearly all portions of Minnesota, particularly in cultivated fields. The seeds mingle with those of brome grass and other forage grasses and are sometimes found on the market under the name of western rye grass to be sown for forage purposes.

Eradication.—Slender wheat grass yields readily to cultivation and is not regarded as a weed. Plowing the land is usually sufficient to eradicate it. Where persistent, discing and harrowing may be resorted to, or a cultivated crop grown.

Yellow Foxtail (*Chaetochloa glauca* L. Nash)

Other common name.—Pigeon grass.

Description.—Yellow foxtail is a very common annual plant closely resembling the common millet. It ranges from one to two feet high, and it has wide spreading branches mostly coming from the crown of the root. The head is from one to three inches long, and is densely covered with yellow bristles. The root is fibrous. The seed is flat on one side and oval in general form. Its color ranges

from greenish yellow, or straw color, to dark brown. On the oval side of the seed a greenish scale extends one-half the length of the seed. The oval is more or less roughed with cross ridges. This is a very common weed, but not a very bad one.

This weed flowers from June to September, but usually ripens its seeds in July. It thrives in all parts of Minnesota and in nearly all soils, doing best in rich soil. It is a common garden weed, but its seeds are found in grass and clover seeds and in all cereal seeds. It is very common in millet from some varieties of which it can hardly be separated with the ordinary cleaning apparatus.

Eradication.—Yellow foxtail frequently springs up in cultivated crops and matures soon after cultivation ceases. These plants should be pulled or hoed out to prevent the seed from shattering on the land. If the seed matures, it should be removed from seed grain as perfectly as possible.

This weed will yield to short rotations and frequent thorough cultivation. The plants are easily smothered when young. The early use of the harrow in cultivated crops will destroy most of the plants. Where a crop of seed has ripened and shattered out, the seeds may be covered by discing. This will induce germination and the plants can be destroyed by plowing or cultivation.

Green Foxtail (*Chaetochloa viridis* L. Nash)

Other common names.—Pigeon grass, bottle grass.

Description.—This grass is very similar to yellow foxtail. It grows somewhat taller and its branches are not quite so spreading. It seeds earlier than yellow foxtail and the flowering head is somewhat longer and more bristly. The bristles are longer and are green in color instead of yellow. The seed is smaller and is often entirely covered with a straw colored covering. The seed has the same variations in color that were noted in yellow foxtail, except that the brown seeds are often mottled in appearance. No cross ridges appear on the seed. In other respects the statements made in connection with yellow foxtail apply to this weed which is closely related to it, but is probably even more common than yellow foxtail.

Eradication.—See yellow foxtail.

Wild Oats (*Avena fatua* L.)

Description.—Wild oats closely resemble our cultivated varieties of oats. Possibly they are the source from which our oats came. The plant grows from two to four feet high and is commonly found in fields of oats, barley, wheat, and rye. It ripens somewhat earlier

FIG. 8. Three stages of growth of the *green foxtail* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 9. *Green foxtail*, entire plant ($\times \frac{1}{3}$).

FIG. 10. Two stages of growth of the *wild oats* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 11. *Wild oats*, showing the fruiting panicle and the root system ($\times \frac{1}{3}$).

than cultivated oats, and many of the seeds fall to the ground to grow the following year. After the seeds have been in the ground twenty months they are practically all dead. They are hard to separate from oats and barley.

The seeds are sometimes yellow in color and sometimes black. They always have a black twisted awn which is sometimes broken off. Some cultivated varieties have this black awn also. One of the best marks of identification in the seed is the horseshoe-shaped scar at the base of the seed which is surrounded by hairs or bristles. These bristles are often broken off, but the horseshoe scar remains. The wild oat is a bad annual weed.

Wild oats flower before the end of June and ripen by the middle of July. The seed is sown with that of some crop, carried by threshing machines, or distributed in manure which has not been well rotted. A seed on the ground will be firmly fastened in the soil by the twisting and untwisting of the awn which twists up when dry and untwists again when moist. Any cereal grain growing in any part of the State may be infested with this pest. Loose seeds are found particularly in oats, barley, wheat, flax, and large-seeded grasses.

Eradication.—Stop sowing seed grain containing wild oats. On infested land, grow early maturing crops such as fall rye and barley, that may be harvested before the wild oats mature. Where wild oats have matured and shattered out, disc the land immediately after harvesting to encourage germination. The plants that start to grow may be destroyed by late fall plowing. A rotation of crops which includes a cultivated crop that may be used as a cleaning crop will greatly facilitate the destruction of wild oats.

Wild oats may be controlled in a five-year rotation, including (1) fall rye, (2) timothy and clover hay, two crops, (3) pasture, (4) corn, and (5) barley.

A three-year rotation of (1) fall rye, (2) clover hay, two crops, (3) corn for ears or silage is satisfactory. Cultivate the corn both ways and hoe or pull stray plants by hand if they appear.

Curled Dock (*Rumex crispus* L.)

Other common names.—Dock, yellow dock, sour dock.

Description.—Curled dock is a perennial weed, with a large tap root, sometimes two feet long. The plant is from two to three feet high and has large leaves with a wavy margin. The name "curled dock" comes from the wavy appearance of its leaves. The flowers and seeds are found at the top of the plant and the mature seeds are brown in color. The seed proper is triangular, brown and shiny,

and grows in a small pod which easily floats on the water. The plant flowers in June and ripens its seeds in July. It is found in fields and waste places throughout the State and its seeds occur among those of red clover, coarse grasses, and all cereals.

Eradication.—Curled dock is readily eradicated by short rotations and cultivated crops. Where scattering plants are found in fields, they should be cut off deeply below the surface with a spade or "spud." Young plants may be pulled by hand when the ground is soft and wet. Avoid sowing the seed with grain or grass seed.

Sheep Sorrel (*Rumex acetosella* L.)

Other common names.—Sour grass, field sorrel, red sorrel.

Description.—Sheep sorrel is a perennial weed with shallow running root stalks which are yellowish in color. It is one of the few perennial weeds that are easily subdued. The leaves are on long stalks at the base of the plant. They are arrow-shaped and more or less silvery in appearance. The leaves on the stem are generally shorter stalked and are somewhat thickened. They have a decidedly sour taste.

Sheep sorrel seldom grows more than eighteen inches high, and is generally only about eight to ten inches high. The flowers are not showy. The seeds are small, somewhat triangular, and covered with a dull brown hull. When this hull is removed, a light brown and very shiny seed appears. The seeds appear both with and without the brown hull in the seeds of clover and all grasses, particularly in alsike and white clover seed from which they are very difficult to remove by the use of the ordinary fanning mill. The plants flower from May until autumn and usually mature their seed during July, August, and September. They are also propagated by shallow rootstocks which send up new plants as described in connection with quack grass. The weed is common throughout Minnesota, thriving in all kinds of soil, but especially in sandy soils.

Eradication.—Sheep sorrel grows most abundantly in thin or worn out meadows. Breaking the meadow and raising corn or some other cultivated crop will usually subdue the weed. The land should be enriched with barnyard manure before reseeding to grass, and an effort should be made to secure a thick stand. On meadows or pastures that can not be plowed top dressing with manure and sowing in additional grass seed will be beneficial. The addition of lime to the soil is also said to aid in thickening the grass and crowding out the sorrel.

FIG. 12. Three stages of growth of the *curled dock* seedling (natural size); also enlarged and natural sized drawings of the seed and fruit.

FIG. 13. *Curled dock* showing a separate leaf and root (× ½).

FIG. 14. Three stages of growth of the *sheep sorrel* seedling (somewhat enlarged); also enlarged and natural sized drawings of the seed.

FIG. 15. *Sheep sorrel*, entire plant (×⅓).

FIG. 16. Three stages of growth of the *smartweed* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 17. *Smartweed*, entire plant (×⅓).

Smartweed (*Polygonum persicaria* L.)

Other common name.—Lady's thumb.

Description.—There are four common smartweeds in this State, but owing to the nature of this species and to the size of its seed it is probably the one most commonly found in Minnesota crop seeds.

This plant is an annual growing from twelve to twenty inches high. The leaves are short stalked and are narrow and pointed. Often the leaves are marked with a dark triangular spot near the middle. The plant is sparingly branched and the flowers are of a pinkish hue and not very large. The seeds are either lens-shaped or triangular. The triangular-shaped seeds are less common. The seeds are generally jet black and very shiny. Some of the more immature seeds, however, are reddish brown. A pinkish or brownish sheath often surrounds the seed. These seeds are most commonly found in red clover, but occur in grass seed and cereals also. They are separated with ease from cereals, but with greater difficulty from red clover. Flowering continues during the latter part of July to August and the seeds usually ripen during August and September. The weed requires rich, moist soil, thrives well in swamps or along streams and lakes and is quite generally distributed throughout the State.

Eradication.—Smartweed is not usually troublesome in cultivated fields. If low land and marshes are drained and put under cultivation, the weed will disappear. In low pastures or meadows that can not be drained or tilled the smartweed should be cut frequently enough to prevent seeding. Grasses adapted to the conditions should be sown thickly to crowd it out.

Lamb's Quarters (*Chenopodium album* L.)

Other common names.—White goose-foot, pigweed.

Description.—Lamb's quarters is an annual plant growing from two to three feet high or in some cases six feet high. The entire plant has a sort of silvery grayish appearance, and is more or less covered with a white mealy substance. This plant varies greatly in appearance. Often it is much branched, but some plants have very few branches. The leaves are whitish green, coarsely toothed and have long stalks. The silvery coating is more prominent on the under side of the leaf. The flowers are clustered into conspicuous green balls. The seeds vary in appearance depending on the degree of ripeness and the manner in which they have been threshed out. When all the coat has been removed, the mature seed is black and shiny, resembling the pigweed seed. It is lens-shaped and about

a twentieth of an inch in diameter. Generally a dark gray covering almost entirely envelops the seed, leaving a shiny black spot, uncovered in the center. Immature seeds are reddish brown. The young plants are often used for "greens."

Flowering continues from June until autumn, and the seeds ripen from the latter part of July until the plant is killed by frost. The plant thrives best in rich soil, being common in cultivated fields and gardens throughout the State. The seed is found mingled with that of grass and clover, and with all cereals.

Eradication.—Lamb's quarters is not a persistent weed, but it spreads rapidly because of its heavy seeding propensity. Avoid sowing the seed. Crop rotations and clean cultivation will hold it in check.

Where fields are badly infested with seeds, it will be wise to disc the land immediately after the crop is off to cover the seeds. The plants resulting from early germination may be destroyed by plowing later in the fall. Frequent cultivation of the seed bed before sowing the grain crop will aid in exterminating the weeds. If the weeds should start thickly in the grain, they can be destroyed by harrowing it when three to four inches high without injuring the grain materially. In cultivated crops, late plants should be watched and destroyed before the seed ripens.

Pigweed (*Amaranthus retroflexus* L.)

Other common names.—Red root, rough pigweed, green amaranthus, Chinaman's greens.

Description.—Pigweed is an annual weed which grows from a well-formed and fairly deep rooted tap root. The root is generally red, which gives this plant its name "red root." The plant grows from one to three feet high and is branched, the branches coming obliquely from the stem. Stem and leaves are rough. The leaves are long stalked. The flowers are very inconspicuous and are formed in the angle formed by the stem and leaf stalk. The seeds are oval, small, black, and shiny. Pigweed does most injury by crowding out crop plants. It flowers from July to September, but usually ripens its seeds during August or before. The seeds occur in those of almost all other crops, particularly clover, alfalfa, timothy, and grass, but are not difficult to remove by means of cleaning machinery. The weed occurs in all parts of the State and thrives in all kinds of soil, but prefers a rich loam. It is common in gardens and waste places.

Eradication.—Prevent pigweed from going to seed, and avoid sowing the seed in grain and grass seeds. Frequent and thorough cultivation of the seed bed before sowing the seed will check growth

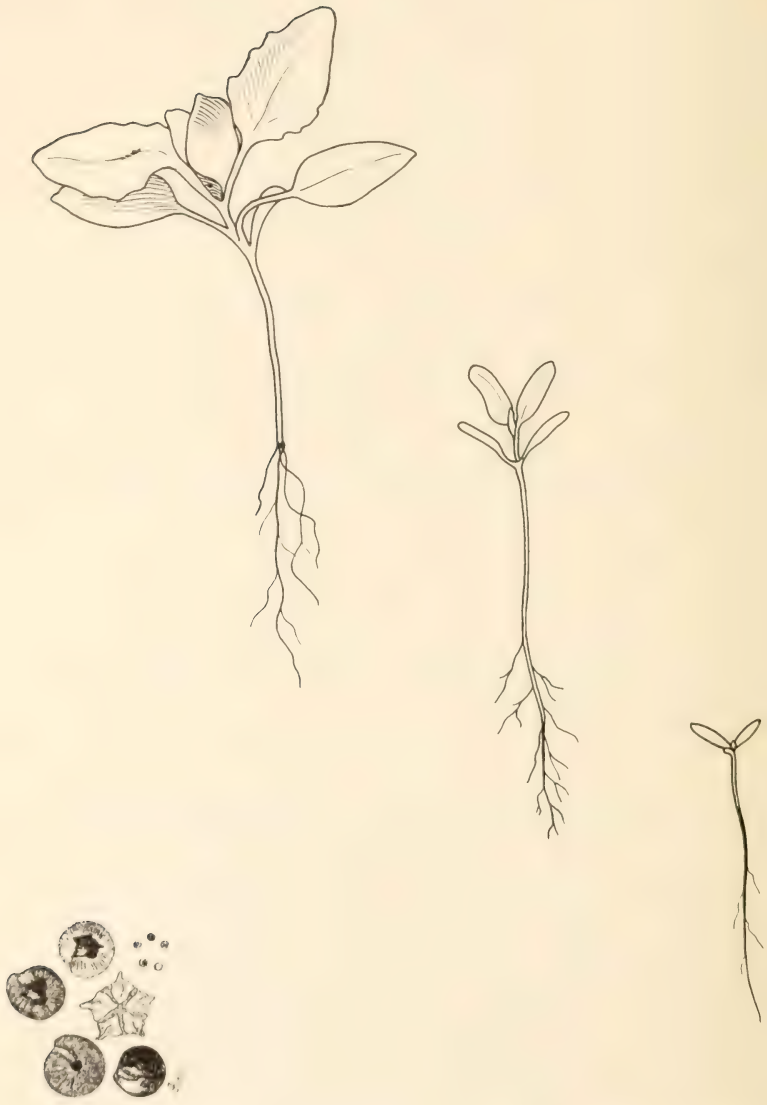

FIG. 18. Three stages of growth of the *lamb's quarters* seedling (natural size); also enlarged and natural sized drawings of the seed and fruit.

FIG. 19. *Lamb's quarters* showing top of plant and root system ×⅛).

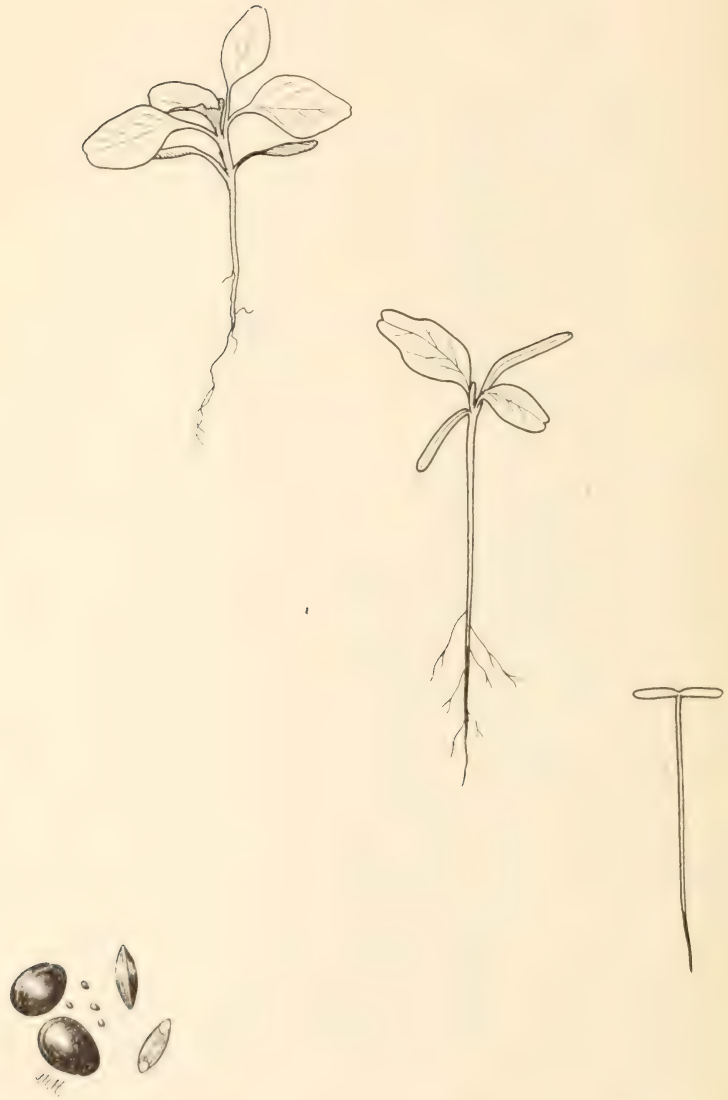

FIG. 20. Three stages of growth of the *pigweed* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 21. *Pigweed*, showing top of the plant and the root system (× ⅛).

FIG 22. Three stages of growth of the *Russian thistle* seedling (natural size); also enlarged and natural sized drawings of the seed and fruit.

FIG. 23. *Russian thistle* showing branch of young plant (× ½) in the center, one of a mature plant (× ½) at the right, and a small drawing of the entire plant (× 1-15) showing general shape at the left.

in grain fields. Good plowing, thorough cultivation, with some hand hoeing and pulling, will eradicate the weed from cultivated crops. It does not give serious trouble in fields where crops are grown in a good rotation. It is most troublesome in gardens, but shallow cultivation and hoeing or pulling by hand will eradicate it.

Russian Thistle (*Salsola tragus* L.)

Other common name.—Tumble weed.

Description.—This is an annual weed which is supposed to have come from Russia in some imported flaxseed. The plant is from one to three feet high and covers an area ranging from a few inches to six feet in diameter. It has a bushy appearance because of its profuse branching. The color is light green and the stem, branches, and upper leaves are striped longitudinally with reddish purple lines. The root is a small white tap root. The leaves are small and each tapers to a sharp spine. These spines account for the fact that the plant is called a "thistle," even though it does not belong to the true thistle family as the bull and Canada thistles do. The flowers are nearly hidden by the spines. They are generally of a bright rose color, very thin, and papery. It is estimated that a good sized plant will produce from 100,000 to 200,000 seeds.

The seed is sometimes covered with a thin gray hull. When this coat is removed the seed has the appearance of a snail shell. This is because the embryo is spirally coiled.

The seed is found in flaxseed, grass seed, and clover seed, but most especially in western alfalfa seed. The plant flowers from July to August, and usually matures its seed late in August and during September and October. In autumn the stem becomes weak and brittle just above ground and the entire plant breaks away and tumbles over the ground, scattering its seeds as it goes. This gives it the name tumble weed. The plant is very common in this State, especially in light, sandy soil. It thrives in dry seasons, but is easily kept in check by growing crops in wet seasons.

Eradication.—Prevent Russian thistles from maturing by cultivation or harrowing. The plants are easily destroyed while small, but if they mature, they should be gathered and burned before they break loose and blow away scattering seeds as they go. Good plowing and careful seeding or planting so as to occupy the land fully will prevent the growth of the Russian thistle in most seasons. Plants growing on waste places should be destroyed or burned at maturity to prevent seeds blowing over the fields.

Corn Cockle (*Agrostemma githago* L.)

Other common names.—Purple cockle, corn rose, and corn campion.

Description.—This weed is often found in wheat fields. It received the name of corn cockle in England where wheat is generally spoken of as "corn." The plant is an annual growing from one to three feet high without branching very much. It is covered with fine silky hairs and has slender leaves between two and four inches long. The large purple flowers about one and one-half inches across are very conspicuous. The seeds are formed in a pod apparently underneath the flower. This pod enlarges when the seeds mature and finally breaks open so that the seeds can be discharged. The seeds of this plant are dull black, varying from one-twelfth to one-eighth of an inch in diameter. The seeds are sometimes dark brown in color. They are more or less angularly rounded. The surface of the seed is much roughened by ridges of short spines. This seed is poisonous to fowls and cattle, and flour in which much of it has been ground is said to be injurious.

It is almost impossible to separate corn cockle from wheat except by specially constructed cockle machines and even these do not make a complete separation. The plant flowers during July, and ripens its seeds late in that month or in August. It is quite generally distributed throughout the State, especially in wheat-growing regions.

Eradication.—In seeking to control this pest, avoid sowing grain containing the seed. Pull small patches or stray plants to prevent reseeding. Rotate in such a way that grain is not raised more than once in four or five years on the same land. This may be accomplished by using the following rotation: (1) barley, (2) timothy and clover hay, two crops, (3) pasture, (4) corn, and (5) wheat.

White Cockle (*Lychnis alba* Mill)

Other common names.—Evening lychnis, white campion.

Description.—This is a biennial, or a short-lived perennial plant. It generally produces roots and leaves the first year and sends up a flowering stalk the second year. The plant is from one to three feet high and is sparingly branched. It is more or less hairy. The flowers are pure white and quite conspicuous. Each flower is five-parted, or has five petals, and each petal is partly divided into two parts. The seeds are formed as in corn cockle in a pod, apparently underneath the flower. When the seeds mature, the pod enlarges and breaks and the seeds are scattered. The seeds are small and of a grayish color. When the seed is immature, it is reddish in color.

FIG. 24. Three stages of growth of the *corn cockle* seedling; also enlarged and natural sized drawings of the seed. Seedling drawings slightly reduced in size.

FIG. 25. *Corn cockle*, showing flowering branch and root (× ½).

FIG. 26. Three stages of growth of the *white cockle* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 27. *White cockle*, showing top of plant and root system, also a separate flower and mature pod.

They are covered with small projections, giving the seed a rough appearance. This can be easily seen under an ordinary magnifying glass. White cockle is not very common in this State. Night-flowering catchfly, its close relative, is often mistaken for it.

White cockle flowers in June and ripens its seeds in July. It is sparsely scattered throughout the State, occurring in grain crops and meadows. The seed is found in red and alsike clover as well as in imported clover and grass seed.

Eradication.—To eradicate white cockle use a short rotation with cultivated and hoed crops included frequently. A three-year rotation of (1) barley, (2) clover, and (3) corn or potatoes should be effective. Spud out or pull by the roots any stray plants observed. Where thick in meadows, mow early to prevent seed from maturing.

French Weed (*Thlaspi arvense* L.)

Other common names.—Penny cress, stinkweed, field penny cress, bastard cress, mithridate mustard.

Description.—French weed belongs to the mustard family and is considered one of our worst annual or winter annual weeds. It generally grows from the seed in the spring and produces seeds before the end of the season. Some of the early seeds grow and seed again before frost or else die down, continuing to grow as soon as they thaw out, producing seed early. This plant is often called "stinkweed" because of its disagreeable odor, which is very noticeable. It grows from six inches to two feet high and has white flowers like the flowers of the peppergrass, only they are much larger, about one-sixth of an inch across. The pods are nearly three-fourths of an inch across and much flattened. When the plant is mature, the pods are light yellow in color. The leaves at the ground have petioles or stalks, but on the branches they clasp the stem. The seeds are reddish brown and oval. On the surface of the seed are concentric rings which make the seed very beautiful when examined under the magnifying glass.

The weed flowers almost continuously from early in June until frost, and begins to ripen its seeds in July. It thrives in all kinds of soil, and is rapidly spreading and becoming established in all parts of the State. The seed occurs in millet, clover, cereals, and flax-seed. It is readily separated, however, from the cereals with ordinary cleaning apparatus.

Eradication.—Avoid sowing the seed and prevent plants from maturing. This requires constant attention as some of the plants may mature seeds early in the summer and others at later periods

leading to almost continuous seeding. The plants may even mature their seeds after they have been covered by the plow if the soil is dry.

If the weeds are found growing in the grain fields in large numbers early in the season, they may be checked and many of them destroyed by harrowing once or twice with a light, peg tooth harrow, when the grain is three or four inches high.

Discing the land as soon as the grain crop is removed will hasten the germination of the seeds. Plow later in the fall and disc or replow in the spring. Seeding down to the tame grasses and clovers will bring about complete eradication.

The following rotation is suggested: (1) Wheat. Seed bed carefully prepared and timothy and clover sown. If weeds are bad, defer sowing grass seed until grain is harrowed, when three or four inches high. (2) Timothy and clover hay, two crops. (3) Timothy hay or seed. Break in fall. (4) Corn or potatoes. (5) Wheat. (6) Barley or oats. (7) Wheat, and seed down.

Peppergrass (*Lepidium apetalum* Willd.)

Other common name.—Apetalous peppergrass.

Description.—This plant belongs to the mustard family. It is an annual and winter annual which grows from six inches to two feet high. The plant at first forms a rosette of leaves flat on the ground. Later the flowering stalk is produced. The plant is much branched which gives it a bushy appearance. The flowers are white, very small, and inconspicuous. The seed pods are about one-tenth of an inch wide and somewhat heart-shaped, being notched at the tip. Each pod has two seeds, which are reddish yellow. The seeds are oval and very flat and thin. There is a curved groove on one face of the seed. Peppergrass is not considered a very serious weed, and does damage only by crowding out other plants.

Peppergrass flowers early in June and in July, and early plants ripen seeds by the end of June. It is propagated only by seeds, but the plant sometimes breaks away and scatters the seeds as it is blown before the wind. The weed thrives in all kinds of soil and is usually found in gardens, meadows, and by the roadside in all parts of the State. The seed is readily distinguished from that of timothy, clover, and grasses by its bright yellow color.

Eradication.—Prevent peppergrass from seeding by mowing it while green. Disc or plow, if possible, to destroy the roots. It is troublesome mainly as a roadside and waste-place weed.

Shepherd's Purse (*Bursa bursa-pastoris* L.)

Other common names.—St. James weed, case weed, mother's heart.

FIG. 28. Three stages of growth of the *French weed* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 29. *French weed*, mature plant (× ½).

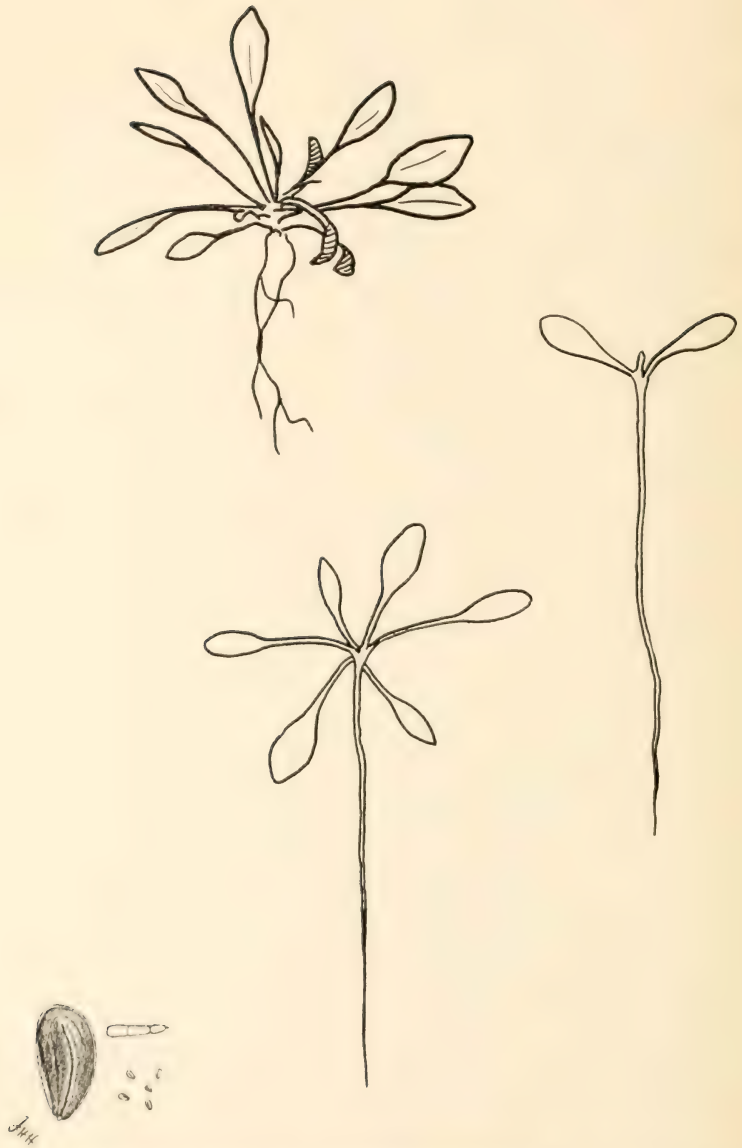

FIG. 30. Three stages of growth of the *peppergrass* seedling (×2); also enlarged and natura sized drawings of the seed.

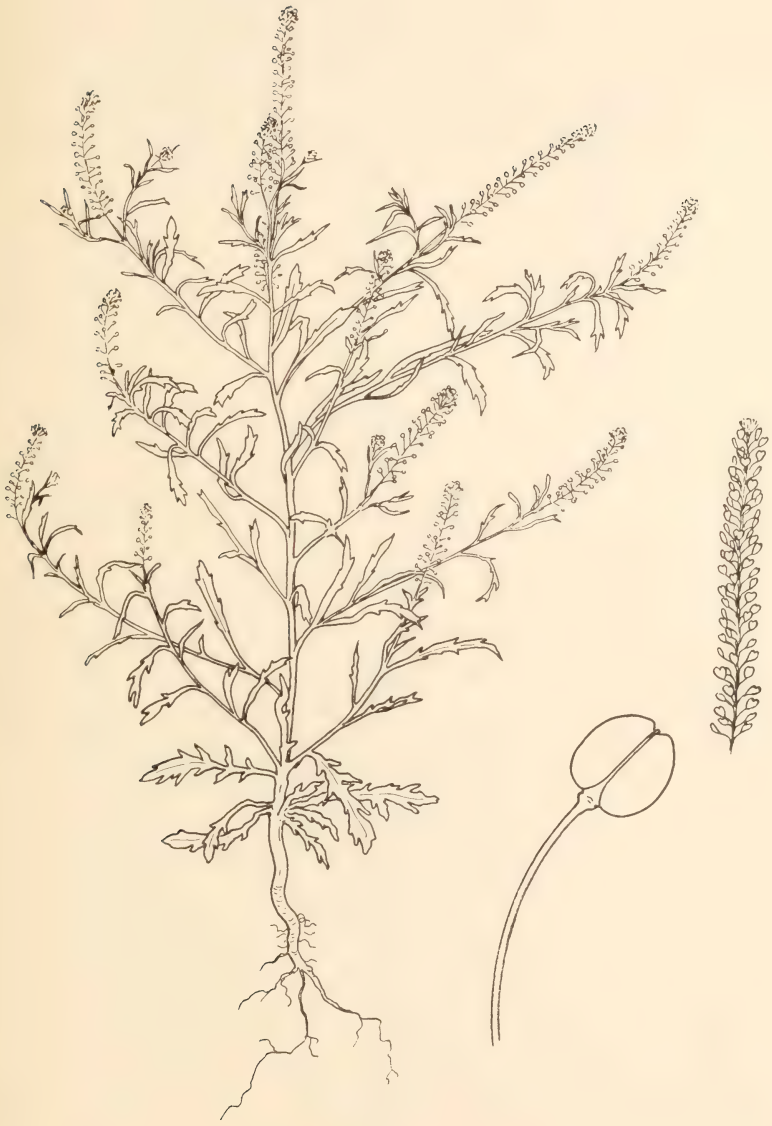

FIG. 31. *Peppergrass*, entire plant (×½), a branch with fruit, and an enlarged pod (×4).

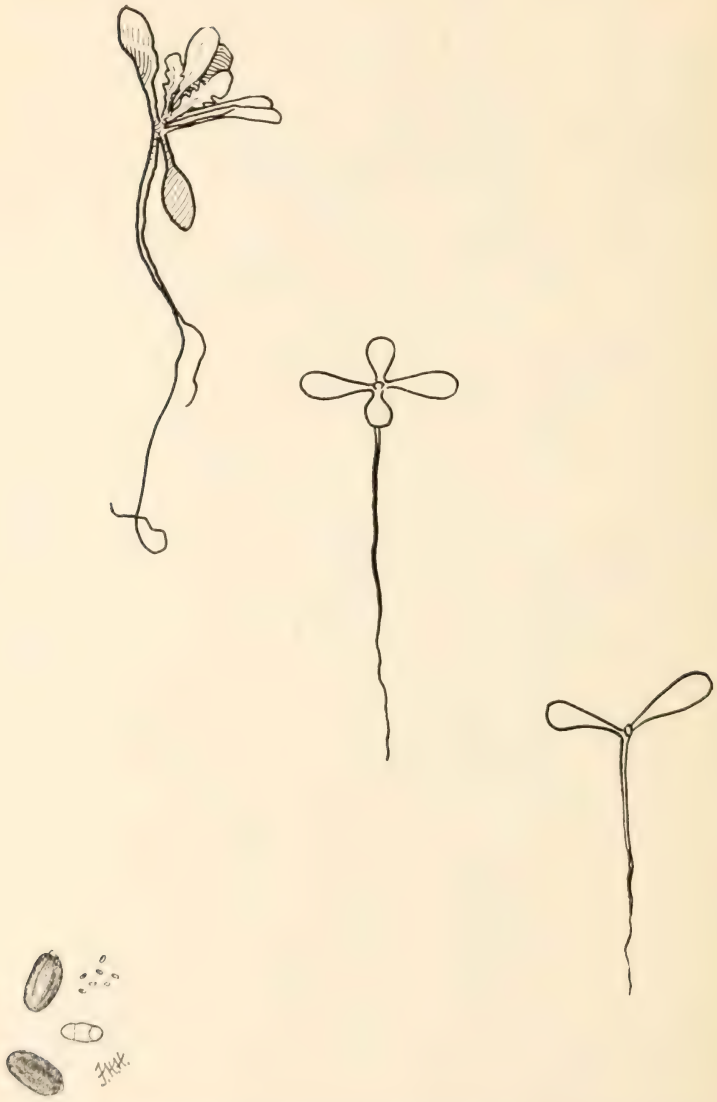

FIG. 32. Three stages of growth of the *shepherd's purse* seedling (×2); also enlarged and natural sized drawings of the seed.

FIG. 33. *Shepherd's purse*, entire plant (×½) and an enlarged pod (×3 .

Description.—Shepherd's purse belongs to the mustard family. It is generally an annual, but is sometimes a winter annual. It has been found in flower as early as March. The large leaves, which are more or less notched, form a rosette at the base of the plant. The smaller leaves are arrow-shaped. The plant varies from six to twenty inches in height. It has small white flowers. The seed pod is triangular in shape and about a quarter of an inch in diameter. The name, shepherd's purse, is derived from the shape of the seed pod. The reddish yellow seeds are so small that a single plant often produces 50,000 of them. They are found in clover and grass seed, particularly in lawn grass mixtures. The plant flowers and matures seed throughout the season. It is found in waste places, orchards, and gardens, and grows in all kinds of soil and in nearly every part of the State.

Eradication.—Shepherd's purse is troublesome mainly because of its early and prolific seed-bearing qualities. It is easily subdued by good plowing and clean culture. It yields readily to the cultivator and hoe and may be held in check by any good arrangement of crops in rotation. It often gains a foothold where bare spots have been left in grain fields or at roadsides or in thin meadows and pastures. Well-prepared seed beds and full seeding will prevent the appearance of the weed in most cases.

Wild Mustard (*Brassica arvensis* L.)

Other common names.—Charlock, field kale, corn kale, corn mustard.

Description.—Wild mustard is so common that a description is hardly necessary. It is an annual weed which grows from one to three feet high. It is covered with short stiff hairs, and is often much branched. The flowers are bright yellow and quite conspicuous. The podlike fruit is generally about one and one-half inches long. When the seeds are mature, the pod opens and discharges them. The seeds are round and comparatively smooth; the size is somewhat variable, and the color either black or reddish brown. As the seed contains a large percentage of oil, it will lie in the ground for a long time without losing its germinating power. They have been known to lie dormant for fifteen years and then germinate. They are found in all cereals and are common in red clover. They are easily separated from cereals, but not from clover as they are about the same size as clover seed.

Eradication.—Wild mustard is one of the most troublesome weeds because of its persistent seeding habit and the endurance of the seeds when buried in the soil. It is most common in fields that are devoted

exclusively to grain growing and disappears when a system is introduced which provides for grass and cultivated crops. The vital point in the process of eradication is to prevent the seeds maturing and shattering out.

Where fields are infested, the land should be worked up with a disc or spring-tooth harrow after the grain is harvested to cover the seeds and induce germination. The plants resulting may be destroyed by fall plowing or by freezing, preferably by fall plowing. The fields should be cultivated reasonably early in the spring and before the crop is sown, if grain is raised, to kill any plants that may have started. If the cultivation can be kept up until early in May, many of the young plants will be destroyed. A liberal seeding of grain should be made when the soil is well prepared so that growth may be quickly made and will fully cover the ground. If the mustard starts in the grain, many of the young plants may be destroyed by harrowing with a light spike-tooth harrow. If scattering plants appear in the grain, they should be pulled by hand. If, in spite of the careful preparation of the land, the field should still be badly infested with mustard, the plants may be destroyed without injury to the grain by spraying with a solution of sulphate of iron. The solution must be applied with a sprayer before the plants pass through the blossoming stage if it is to be effective. The solution should be made up at the rate of from 75 to 100 pounds of iron sulphate to 52 gallons of water. The cost will vary with the locality, the help available, and the equipment used. It will not be more than $1.00 or $1.25 per acre in most localities.

A good crop rotation will do more to aid in keeping mustard in check than anything else. The arrangement of crops may be varied to suit the needs of the individual farm. Where grain raising is principally followed for climatic or other reasons, it may be difficult to meet all of the requirements of a good rotation, but some modified form can be used to advantage. We would suggest this five-year rotation: (1) grain seeded to timothy and clover, (2) hay, (3) hay or pasture, (4) corn, and (5) grain.

The hay land should be broken in the fall of the second year and the land carefully prepared in the spring for corn. Thorough cultivation must be given the corn and stray mustard plants removed by hand pulling or hoeing.

A good seven-year rotation for grain growers is (1) barley, seeded to timothy and clover, (2) hay, (3) hay, (4) corn, (5) wheat, or flax, (6) oats, and (7) wheat.

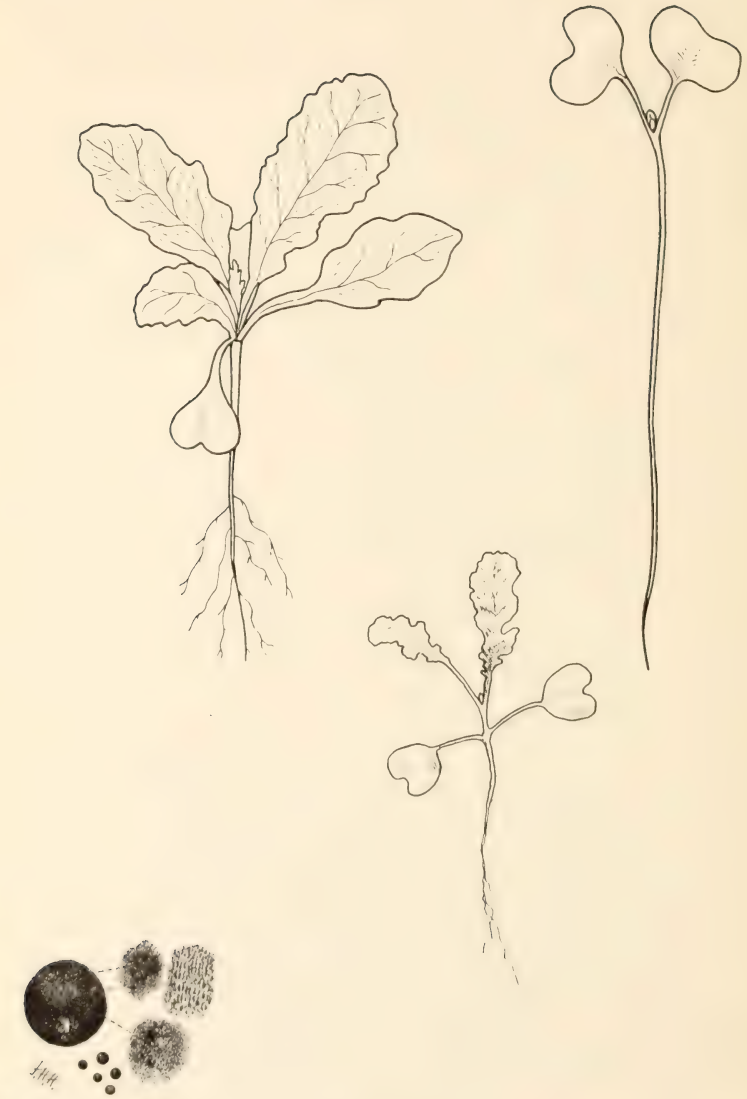

FIG. 34. Three stages of growth of the *wild mustard* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 35. *Wild mustard*, showing top of plant (× ¾), and slightly enlarged pod and flower.

FIG. 36. Three stages of growth of the *yellow trefoil* seedling (natural size); also enlarged and natural sized drawings of the seed and fruit.

FIG. 37. *Yellow trefoil* showing both flowers and fruit (× ½).

Yellow Trefoil (*Medicago lupulina* L.)

Other common names.—Black medic, black seeded hop clover, none-such.

Description.—Yellow trefoil is an annual belonging to the clover family. It is grown in European countries as a forage plant on poor, worn-out land. It is not considered a good forage plant in this country. It is a low plant with wide spreading branches. It has bright yellow flowers which are borne in roundish clusters at the end of the branches. The pod which bears the seed is from one-twelfth to one-eighth of an inch long. It is black and is kidney-shaped. The pod clings closely to the seed which makes it difficult to thresh out the seed. The seed itself is very similar to alfalfa and to the light colored seeds of red clover, and has been used as an adulterant in these seeds.

The seeds are greenish yellow and have a characteristic beak coming from one side which enables one to distinguish the seed from alfalfa and red clover seeds. The plant flowers from the latter part of May to October and usually ripens its seeds in July. It grows in pastures and waste places, but is not very common in Minnesota. It is troublesome only in rare cases and yields readily to cultivation.

Sweet Clover (*Melilotus alba* Desv.)

Other common names.—White melilot, white sweet clover, honey lotus, tall clover, bokhara clover.

Description.—Sweet clover may be either an annual or a biennial. It is not always a weed, but is esteemed in some sections as a forage plant. It is often planted by bee-keepers because of its value as a honey plant. There are two kinds of sweet clover, one with white flowers and the other with yellow. The white sweet clover, which is most common in this State, is the one here described. The plant makes a rank growth, often reaching the height of six feet, with thick, much branched stems. The leaves and small white flowers are nearly always borne on the side branches, and the flowers are arranged in long clusters. The seed is encased in a small, brownish pod and resembles that of alfalfa or the light colored seed of red clover. It is yellow, has a dull, rather rough surface, and has been used as an adulterant in alfalfa and red clover seed. The plant flowers in June and ripens its seeds in July. It thrives well in rich soil throughout the State and is a common roadside weed.

Eradication.—Sweet clover is usually subdued by cutting before the seed forms, for two years. It is rarely troublesome in the field as it yields to plowing and cultivation. Many regard it as a valuable forage and hay crop.

Kinghead (*Ambrosia trifida* L.)

Other common names.—Tall or giant ragweed, house cane, greater ragweed, crown weed, bitter weed, tall ambrosia, richweed, kingweed.

Description.—Kinghead is an annual weed which grows from three to fifteen feet high. It grows so rank that it often crowds out all other vegetation. The leaves and stem are very rough. The lower leaves are deeply cut, while those near the top are entire. The whole plant is pale green. The upper flowers produce the pollen or yellow dust. This pollen falls on the lower flowers which develop the seeds; the latter flowers are found near the base of the leaf where it joins the stem. The seed is about one-fourth of an inch long, tapering to the base. At the top, or large end, of the seed there are from six to eight points. The plant flowers in July and ripens its seeds in August. It is found along roadsides and by lakes and running streams throughout the State, but especially in the northwestern part. The seed is found in cereal grains, especially in wheat, from which it is hard to separate with the ordinary cleaning machinery.

Eradication.—Cease sowing grain containing the seeds. Because of the great difficulty of separating from seed grain it is desirable to buy seed from an uninfested farm or locality. When necessary to use seed wheat containing seeds of kinghead, much of the latter may be floated off by immersing the seed grain in water. The kinghead is light and may be skimmed off when it rises to the top. The weeds usually appear near the roadside or edges of the fields, where they can be cut with a mower before the seed matures. In some seasons they will spread through the grain crops and crowd them badly. Then they should be hand pulled or cut with a scythe. The main point is to prevent them from going to seed. These weed seeds in wheat seriously injure its flour-making quality and lessen the value of the crop.

Ragweed (*Ambrosia artemisiaefolia* L.)

Other common names.—Smaller ragweed, hogweed, bitter weed, carrot weed, Roman wormwood.

Description.—Ragweed is somewhat similar to kinghead. It differs in that both plant and seed are smaller, and its leaves are more deeply cut. It is an annual weed which grows from one to three feet high. The stem, branches, and leaves are much divided and somewhat hairy. As in kinghead the upper flowers pollinate and fertilize the lower ones. When the plant is discharging its pollen, it has a very yellowish appearance. This occurs late in July and

FIG. 38. Three stages of growth of the *sweet clover* seedling (natural size); also enlarged and natural sized drawings of the seed and fruit.

FIG. 39. *Sweet clover* (×⅜), showing branch, also enlarged flower (×2).

FIG. 40. Three stages of growth of the *kinghead* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 41. *Kinghead*, showing top of plant (× ½).

FIG. 42. Three stages of growth of the *ragweed* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 43. *Ragweed*, showing top of plant ($\times \frac{1}{3}$).

early in August. This pollen is dreaded by hay fever sufferers. The seeds of ragweed are very similar to those of kinghead, except that they are smaller. They are brown in color and have sharp points at the large end of the seed. Ragweed causes dairy men a great deal of trouble because it taints the milk and butter when eaten by cattle.

The plant flowers in July and early in August, and ripens its seeds in August. It is found along roadsides and waste places in all parts of the State and grows in all kinds of soil, but thrives especially well in rich black loam. The seeds are very commonly mingled with red clover seed and cereals.

Eradication.—Ragweed is an annual which grows in rich soil that is not fully occupied by a growing crop. A short rotation, three or four years preferably, which includes a grass or clover crop and a cultivated crop, will help to clean infested fields. The cultivated crop should follow the grass crop and the field must be carefully watched for late plants. Hand hoeing is often required to make the eradication complete. The seed should be prevented from maturing if possible. Cutting infested spots and roadside strips before the seed is mature is a common method of holding it in check.

Burdock (*Arctium lappa* L.)

Other common names.—Clot bur, great bur, cockle button, beggar's button, stick button.

Description.—It is a biennial plant with a large deep tap root. The plant is generally recognized by its large entire leaf which is often more than a foot across. The leaves are generally fuzzy beneath, and the leaf stalk is hollow. The first year this plant merely develops a leaf and root system. The second year the branched flowering stalk is sent up, sometimes six feet high. At the ends of the branches the purple-tipped flower burs are formed. These burs produce the seed and, when the seed is mature, the burs become yellow brown. The bur is often three-fourths of an inch in diameter. The seeds are gray but spotted with brown. They are about one-twelfth of an inch long and wider at one end than at the other. The burdock is especially bad in sheep and horse pastures as the burs get into the wool of the sheep and the manes and tails of the horses.

The burdock flowers in July and August, and seeds in September. It is a typical backyard weed but is often found in fence corners, orchards, waste places, and by the roadside. It rarely proves troublesome in cultivated fields, although it thrives best in rich soil. The seed is seldom found in that of any farm crop, but is distributed by means of the burlike heads with hooked tips which catch and cling to the hair and fur of various animals.

Eradication.—The burdock disappears as doorvards and groves are put under cultivation. Continued cutting will exhaust the plants and, in time, exterminate them. The process may be hastened by cutting off deeply below the surface and applying a handful of salt or a few drops of gasoline or kerosene to the root of each plant. Where the trees are not too thick and the yards are badly infested, it will be best to plow the land and grow a crop of corn or potatoes before reseeding. Cutting off below the crown with a "spud" is the best treatment where only a few scattering plants exist.

Canada Thistle (*Carduus arvensis* L. Robs)

Other common names.—Way thistle, cursed thistle, corn thistle, hard thistle, creeping thistle.

Description.—The Canada thistle is a perennial which ranges from one to three feet in height. The stem is much smaller than that of most other thistles and has few spines. The leaves, however, are very spiny and the margin has a ruffled appearance. The under side of the leaf is somewhat hairy, while the upper side, which is bright green in color, is either smooth or slightly hairy. The flower heads are about half an inch in diameter, and rose-purple in color. A white feathery tuft of hairs is attached to the mature seed which aids in the distribution of the same. The mature seed is brown, nearly cylindrical, and about one-eighth of an inch long. The roots are often found two feet or more in the ground, running parallel with the surface. From these roots shoots come to the surface and form new plants. These roots are light yellow and only about one-fourth of an inch in diameter. The Canada thistle is one of Minnesota's worst weed pests.

The plant flowers from June to September, but usually matures seed by the middle of July. It is propagated by running roots as well as seeds, and it has been found that a seed planted in the spring will in two years produce enough scattering plants to cover twenty square feet of ground. The seeds are easily carried by the wind and are most commonly found in medium red and alsike clover. The plant thrives in all kinds of soil and is rapidly being introduced into all parts of the State. It is now most prevalent in northwestern Minnesota.

Eradication.—The first step in the eradication of the Canada thistle is to prevent all plants from going to seed. It is often necessary to go into the grain fields with a scythe or mower and cut down quite large areas of grain in which the thistles are growing, to prevent them from seeding before the main crop of grain is cut. As soon as may be after the grain crop is cut the infested land should be plowed

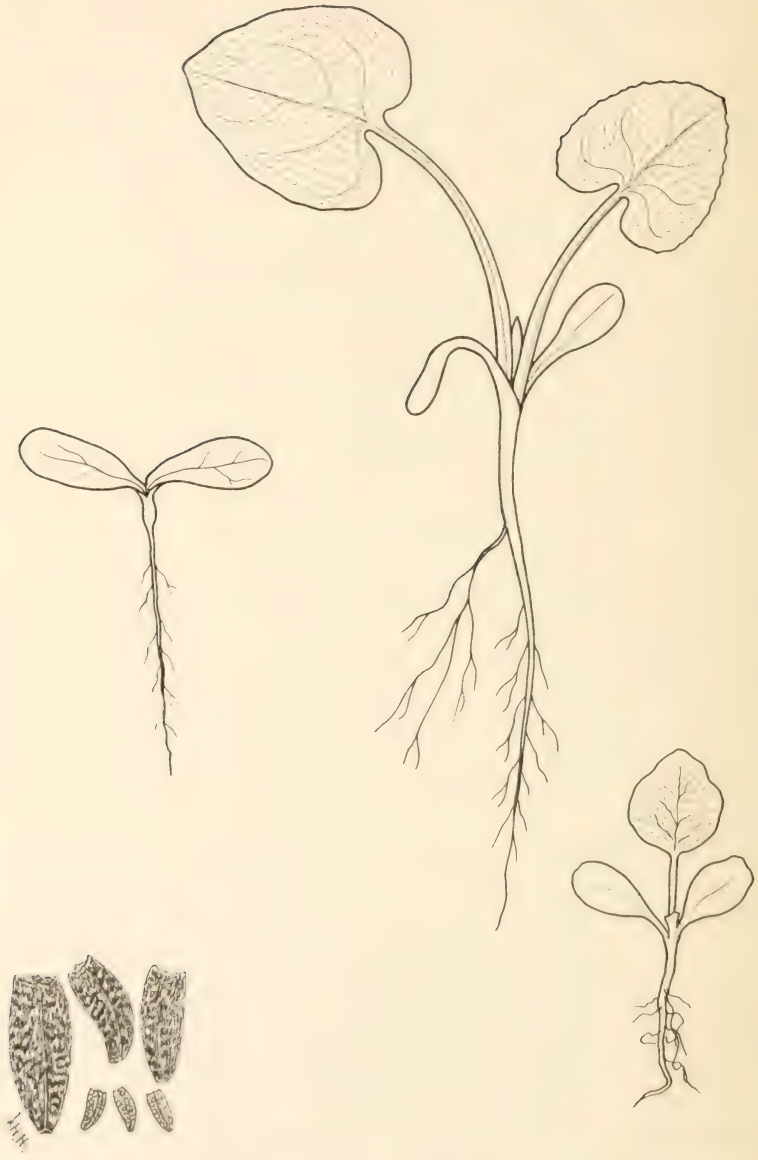

FIG. 44. Three stages of growth of the *burdock* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 45. *Burdock*, showing top of plant with burs (× ⅓); also large basal leaf.

FIG. 46. Three stages of growth of the *Canada thistle* seedling (natural size); also enlarged and natural sized drawings of the seed.

FIG. 47. *Canada thistle*, showing the flowering top of the plant and the underground system ($\times \frac{1}{3}$).

FIG. 48. Three stages of growth of the *bull thistle* seedling (natural size); also enlarged and natural sized drawings of the seed.

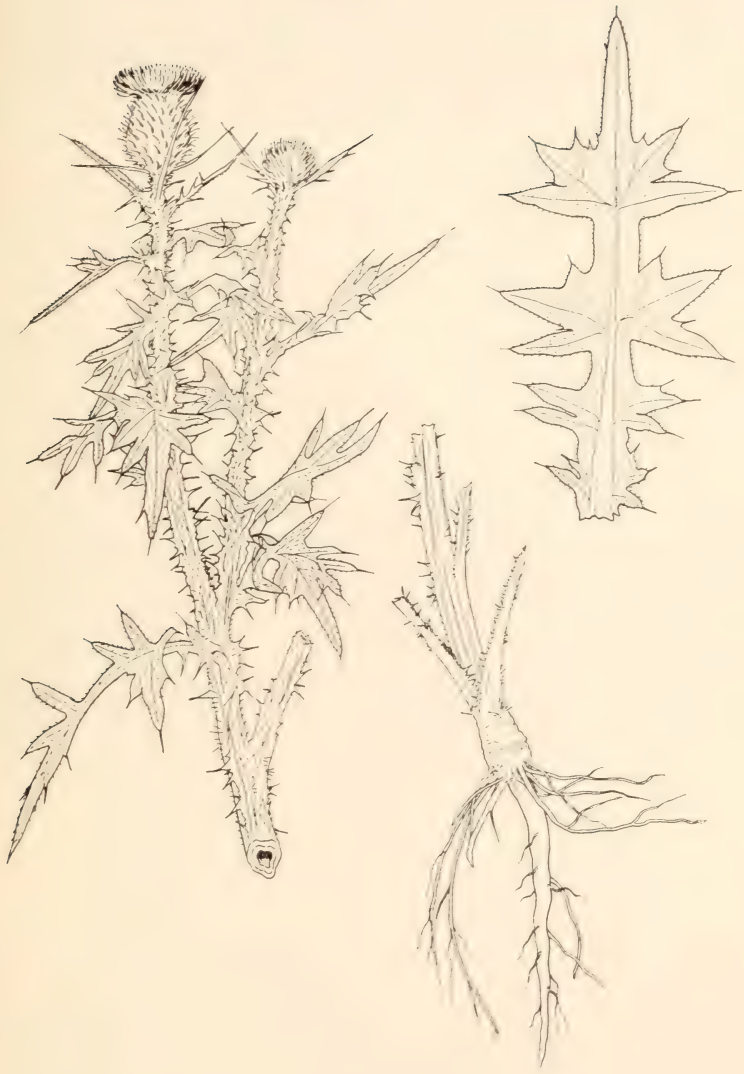

FIG. 49. *Bull thistle*, showing flowering top of plant, separate leaf and roots ($\times \frac{1}{3}$).

deeply enough to bring the roots to the surface. The best time to plow is just as the thistles come into blossom. Discing and surface cultivation may be used during the early fall to prevent the growth of the plants. Then replow late in the fall leaving all the roots possible exposed to the action of the frost. Following this preparatory treatment the adoption of a three-year rotation of barley, clover, corn, or other cultivated crop will be found most satisfactory where clover will grow and corn can be made use of. Barley would, therefore, be the first crop on the land. The land should be prepared for it by double discing at least once before sowing the barley. Clover seed should be sown with the barley at the rate of eight or ten pounds per acre. Needless to say it should be free from Canada thistle seed. The clover will occupy the land during the fall and, if a good stand is secured, will crowd the thistles badly during the next season. The first crop of clover can be cut by June 25 to July 10 before the thistle seeds have a chance to ripen. The second crop will come on rapidly and will again prevent the thistles from spreading much or going to seed. The land should be plowed soon after the second crop of hay is cut. The following spring thorough preparation for the corn crop, clean cultivation, a careful watch for stray plants, and hand hoeing when necessary until October will practically complete the eradication. A repetition of the rotation will be wise, however, to prevent possible reinfestment.

Where clover can not be grown, some other crop, as millet or Canada field peas, may take its place. In strictly grain-growing districts, bare fallowing for a year, discing and cultivating frequently and thoroughly, so as to prevent the leaves from appearing above ground, for at least six weeks during July and August will prove effective though expensive.

Bull Thistle (*Carduus lanceolatus* L.)

Other common names.—Plume thistle, bank thistle, horse thistle, bell thistle, bird thistle, blue thistle, and button thistle.

Description.—The bull thistle is a biennial weed which is often mistaken for Canada thistle. It is, however, much larger and more rugged The stem is from half an inch to an inch in diameter. The leaves are woolly beneath and spiny above, resembling a cat's tongue. The plant blossoms the second year, forming purple flowering heads which are about one inch in diameter It has a tap root instead of a running root like the Canada thistle. The seed is grayish in color, often striped with brown or purple, and larger than the seed of the Canada thistle.

It is most frequently found in seeds of clover and timothy. Its distribution is aided by a white, feathery tuft of hairs attached to the seed. The plant is generally found in pastures and along roadsides throughout almost the entire State.

Eradication.—The bull thistle may be eradicated by preventing the plants from going to seed for two years. Cutting once or twice in a season will usually suffice. It is not generally troublesome in well-tilled fields and disappears under good rotation systems.

SUMMARY OF INFORMATION FOR USE IN THE RECOGNITION OF THE WEEDS DESCRIBED IN THIS BULLETIN

	Name	Class	Color of		Found in
			Flower	Seed	
1.	Quack grass	Perennial	Green	Straw color	Brome grass
2.	Slender wheat	Annual	Green	Straw color	Brome grass
3.	Yellow foxtail	Annual	Green	Straw color, sometimes brown	Millet and clovers
4.	Green foxtail	Annual	Green	Straw color, sometimes brown	Millet and clovers
5.	Wild oats	Annual	Green	Straw color, also black	Cereals, especially oats and barley
6.	Curled dock	Perennial	Greenish yellow	Shiny brown	Red clover
7.	Sheep sorrel	Perennial	Yellow	Brown	Alsike and white clover
8.	Smartweed	Annual	Pink	Shiny black	Red clover
9.	Lamb's quarters	Annual	Greenish	Gray, also black	Clovers
10.	Pigweed	Annual	Pinkish green	Shiny black	Clovers
11.	Russian thistle	Annual	Rose purple	Gray	Alfalfa and clovers
12.	Corn cockle	Annual	Rose purple	Dull black	Wheat and other cereals
13.	White cockle	Biennial or short lived perennial	White	Bluish gray	Clovers
14.	French weed	Annual and winter annual	White	Reddish brown	Clovers
15.	Peppergrass	Annual and winter annual	White	Reddish yellow	Timothy
16.	Shepherd's purse	Annual and winter annual	White	Reddish yellow	Grass seeds
17.	Wild mustard	Annual	Yellow	Black, also brown	Red clover
18.	Yellow trefoil	Annual	Yellow	Greenish yellow	Alfalfa and clovers
19.	Sweet clover	Annual or biennial	White	Brownish yellow	Alfalfa and clovers
20.	Kinghead	Annual	Yellowish green	Brown	Wheat and other cereals
21.	Ragweed	Annual	Yellowish green	Brown	Red clover and cereals
22.	Burdock	Biennial	Purple	Gray mottled	Few farm seeds
23.	Canada thistle	Perennial	Purple	Brown	Clovers and timothy
24.	Bull thistle	Biennial	Purple	Gray striped with brown	Clovers

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The University of Minnesota

AGRICULTURAL EXPERIMENT STATION

BULLETIN 139

MINNESOTA WEEDS

SERIES II

DESCRIPTIONS AND IDENTIFICATIONS

BY

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AND

ERADICATION

BY

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UNIVERSITY FARM, ST. PAUL

MAY 1914

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MINNESOTA WEEDS SERIES II

INTRODUCTION

This bulletin describes the weeds of the seed case Series II shown in Figure 1. The Seed Laboratory of the Division of Plant Pathology and Botany has prepared three cases, each containing the seeds of twenty-four different kinds of weeds.* Bulletin 129, entitled Minnesota Weeds, Series I, which describes the weeds of seed case I, can be obtained by applying to the Office of Publications, University

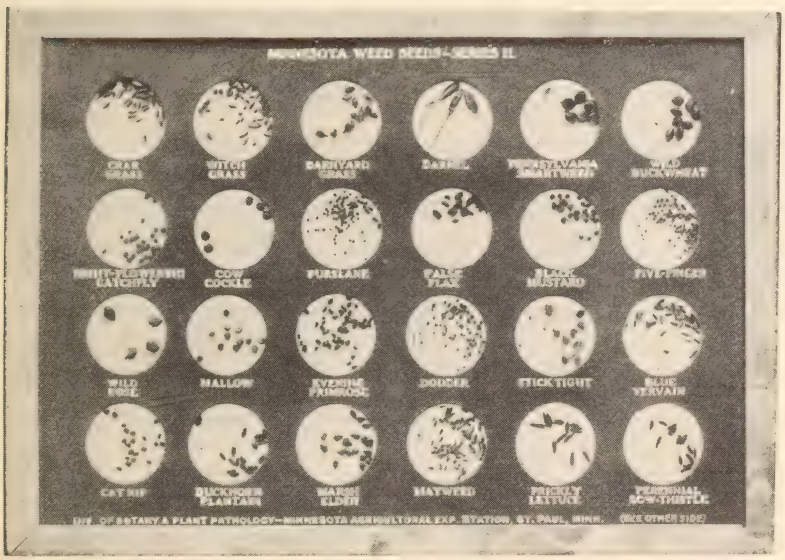

Fig. 1. Minnesota Seed Case, Series II

Farm, St. Paul. A general discussion of weeds appears in Bulletin 129, and will be omitted here. In this bulletin the authors have not adhered to the strictly accurate botanical terminology but have used the terminology of the farm and of the seed trade. This has been done to avoid confusion and to make the bulletin a practical one for farm use. All the drawings in this bulletin are original. The seedling

*The seed cases may be obtained from the Seed Laboratory, University Farm, St. Paul, at a cost of fifty cents for each series. Three cases, each containing twenty-four kinds of weed seeds, are now available.

Fig. 2. Crab Grass

1 Entire plant; 2 enlarged flower spike; 3 seedling; 4 seedling somewhat older; 5 seed natural size and enlarged.

and plant drawings were made by G. D. George, Walter S. Beach, and O. F. Illescas. For the seed drawings the authors are greatly indebted to F. H. Hillman, of the Seed Laboratory of the United States Department of Agriculture.

INDIVIDUAL WEEDS

Crab Grass (*Syntherisma sanguinalis* L. Dulac)

Other common names.—Large crab grass, finger grass, Polish millet, hairy finger grass, crow foot or pigeon grass.

Description.—Crab grass is an annual, spreading plant, usually growing very close to the ground. Its creeping stems are sometimes from one to three feet long. This grass was introduced from Europe and is now found throughout this State, except possibly in the extreme north. It is quite common in cultivated fields and along roadsides but is particularly common in lawns, where it is one of the worst weed grasses. The plant flowers in early autumn and does not mature its seeds until late in August or early in September, so it is particularly troublesome in the latter part of the season. The leaves are generally quite hairy and vary from two to six inches long and often have a very reddish hue. The flowers and seeds are arranged on long, finger-like branches suggesting the name finger grass. These branches are sometimes nearly purple in color. The plant is propagated almost entirely by seed, although sometimes roots spring from the joints of the stem. The seeds of crab grass are about a tenth of an inch long, generally straw-colored or a dull, purplish green. They are convex on one side and nearly flat on the other. Seeds of crab grass are frequently found in lawn-grass mixtures and in seeds of redtop and Kentucky blue grass.

Eradication.—Prevent the plants from going to seed by cutting early and often throughout the season. Owing to the spreading habit of the plant, it is difficult to cut all of the seed stalks with the lawn mower. Hand work with a sickle or scythe is often necessary to complete eradication. Where only a few plants appear in a lawn they should be dug out or pulled as soon as recognized. Thin spots in the lawn should be thickened up by sowing some Kentucky bluegrass seed. Keeping the lawn in good condition by top-dressing occasionally will help also in keeping out crab grass. Little trouble is experienced with this weed in cultivated fields. The above treatment will not completely eradicate crab grass, but will hold it in check as much as possible.

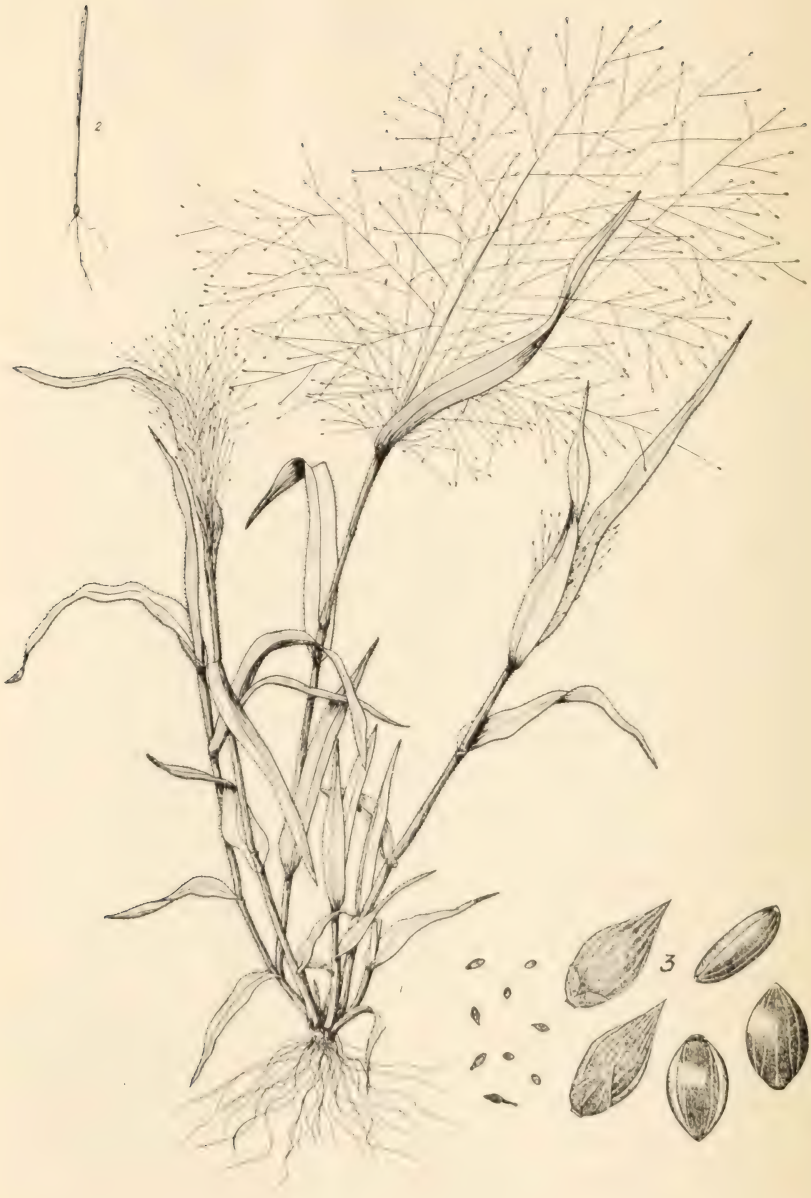

Fig. 3. Witch Grass

1 Entire plant; 2 seedling; 3 seed natural size and enlarged.

Witch Grass (*Panicum capillare* L.)

Other common names.—Old witch grass, tickle grass, tumble grass, tumbleweed, fool hay, and panic grass.

Description.—Witch grass is an annual which matures its seeds any time between July and September. The plant is more or less spreading in its habit of growth and when it is young the leaves are extremely hairy. This grass is easily recognized by the fine, thread-like branches of the much-branched head. Very often the whole plant is nearly purple in color. Witch grass is found quite commonly throughout the State in cultivated fields and along roadsides. It prefers dry, sandy soil. The leaves of the plant are from six to twelve inches long, very hairy, and often purple in color. The flowers are very inconspicuous and are borne on the end of a rather stiff, slender stem. These branches are grouped into a bunch which has a plume-like appearance when the seeds are ready for distribution. The plant is very often called tumbleweed because it easily breaks from the ground at maturity and is carried around by the wind, scattering its seeds. The plant is propagated by small, oblong, highly polished seeds which are often concealed in purple coverings. Seeds of witch grass occur very often among the seeds of the different clovers and in lawn and other grass-seed mixtures.

Eradication.—Do not sow grass seed containing seeds of witch grass. Destroy stray plants as soon as they are discovered and prevent all plants from going to seed whenever possible. This weed yields readily to thorough cultivation.

Barnyard Grass (*Panicum crus-galli* L.)

Other common names.—Barn grass, cockspur grass, cocksfoot grass, water grass, and loose panic grass.

Description.—Barnyard grass was introduced from Europe and now grows in nearly every part of the State. It is an annual plant with a large number of leafy, flattened stems, branching or spreading from the base. Barnyard grass is closely related to the millets and is said to be quite valuable for forage. The plant is quite variable in size and shape as well as in color. Very often the heads are of a deep purplish hue but they may also be green in color. The stems are rather succulent and the growth of this grass is very rapid in the late summer. The leaves are generally smooth, sometimes slightly hairy with a rough margin. The flowers are very small and are crowded closely together in the much-branched head. The seeds are oval, generally yellowish gray but often brown in color. They

Fig. 4. Barnyard Grass

1 Entire plant; 2 seedling; 3 seed natural size and enlarged.

Fig. 5. Darnel

1 Top of plant showing arrangement of seed; 2 root system; 3 seed natural size and enlarged.

Fig. 6. Pennsylvania Smartweed

1 Top of plant; 2 seedling; 3 seedling somewhat older; 4 seed natural size and enlarged.

are about an eighth of an inch in length, flat on one side, and round on the other. The surface is highly polished in appearance. The seeds are very frequently found mixed with grasses and clovers and especially with the different millets. Barnyard grass is propagated entirely by seeds.

Eradication.—Do not sow grain or grass seed containing the seed of barnyard grass. Where seed is in the ground, cut weeds that appear frequently enough to prevent seeds from maturing. Plowing the land and giving thorough cultivation for a season should destroy all seeds and prevent reappearance until seeds are again sown or allowed to mature.

Darnel (*Lolium temulentum* L.)

Other common names.—Ivray, juray, cheat, chess, poison darnel, bearded darnel, tare, neale poison rye grass, and white darnel.

Description.—Darnel is an annual grass introduced from Europe. It is found most frequently in waste places and in grain fields but is not very common in this State. It seems to be most common in the Red River Valley. It often appears in wheat fields and its large seeds, which are about the same size as wheat kernels, are hard to separate from seed wheat. The plant begins flowering in July and seeds mature late in August. The inconspicuous flowers are arranged alternately on a more or less broken spike. The plant varies from two to four feet in height and is very erect. The seeds are about one fourth of an inch long and about one eighth of an inch wide. The seed is ordinarily covered with a hard husk and when this is removed the actual seed is greenish in color, often tinged with purple. The husks are almost always on the seed.

Eradication.—Avoid sowing the seed. Destroy those in the ground by first encouraging germination, and then giving thorough cultivation. Darnel seed can be removed from grain by grading carefully in a strong wind blast.

Pennsylvania Smartweed (*Polygonum pennsylvanicum* L.)

Other common name.—Pennsylvania persicaria.

Description.—Pennsylvania smartweed is an annual plant, which grows from one to three feet tall. It is erect during the first part of its growth but becomes more or less spreading by the time the seeds are mature. This plant grows particularly well in moist soil and is found more commonly in wet years than in dry years. Pennsylvania smartweed is very common along lakes and creeks. It is found in

Fig. 7. Wild Buckwheat

1 Entire plant; 2 plant winding around a stalk of timothy; 3 root system; 4 seedling; 5 seedling somewhat older; 6 seed natural size and enlarged.

nearly every part of the State. It begins flowering in July and continues during August. The seeds are found very soon after the flowers appear and start ripening late in August. The leaves are from two to twelve inches long and are frequently spotted. The pink flowers form a dense cluster. This plant is propagated entirely by seeds which are generally black, although sometimes dark brown. They are almost circular in shape but they come to an abrupt point at one end. When the seed has been entirely threshed out it is found to be very smooth and shiny. The seeds of Pennsylvania smartweed are generally found in the seeds of the clovers and cereals.

Eradication.—Avoid sowing the seed. Where stray plants appear in meadows or pastures they may be removed with a spud or sharp spade. If patches of smartweed appear they should be mowed in time to prevent seed from maturing. The weed yields readily to cultivation.

Wild Buckwheat (*Polygonum convolvulus* L.)

Other common names.—Climbing buckwheat, bindweed, black bindweed, bind corn, corn bind, and ivy.

Description.—Wild buckwheat is an annual plant which was introduced into this country from Europe and is found in all parts of this State except possibly in the extreme north. It is very common in waste places, cultivated fields, grain fields, and along roadsides. This plant has a long, trailing, twining stem, which often reaches to a length of three and one-half or four feet. The stem is more or less branched and produces abundant foliage. Its habit is to twine around the stalks of corn or the grain plants and it often smothers the crops. This is a rather troublesome weed in cultivated fields as well as in grain fields. It begins to flower in July and continues throughout the entire summer. The heart-shaped leaves of wild buckwheat are from half an inch to three inches in length. They closely resemble the leaves of the common buckwheat. The seeds begin to ripen about the first of July. They are three-angled and dull black in color. They resemble the seeds of tame buckwheat to some extent but are much smaller and the color is darker. The seeds are found most commonly in the seeds of the different cereals.

Eradication.—Disk or harrow the grain fields immediately after the crops are removed, to encourage germination of the seeds during the autumn. The plants will be killed by frost. Early spring cultivation before the grain is sown will kill some of those starting in the spring. Where the young plants come up thickly in a grain field

Fig. 8. Night-Flowering Catchfly

1 Entire plant; 2 seedling; 3 seedling somewhat older; 4 capsule containing seed; 5 seed natural size and enlarged.

they can be set back or destroyed by harrowing even after the grain is up. The seeds can be removed from seed grain by screening. Thorough surface cultivation of intertilled crops and short rotations in which grass crops are raised will hold this weed in check.

Night-Flowering Catchfly (*Silene noctiflora* L.)

Other common name.—Sticky cockle.

Description.—Night-flowering catchfly was introduced from Europe. It is an annual or a winter annual and is found in waste places, cultivated fields, and lawns throughout the State but is not considered a very serious weed pest. It belongs to the cockle family and is a very close relative to the common white cockle. The plant is erect, stout, leafy, sticky, and somewhat branched, and the entire plant is covered with soft, spreading hairs. The leaves are from two to five inches long and are gradually narrowed down from a rounded summit. They are several times as long as wide. The few large, showy flowers generally appear late in June, in July, or early in August. They are of a delicate creamy white hue or sometimes purple. The shape of this flower is somewhat like that of the morning-glory, but the five petals are not united into a tube. The flowers are quite fragrant and are open only at night. The seeds are found in oblong pods, each containing a very large number of seeds. The seed is a dull gray with a somewhat roughened surface. This plant is commonly propagated by seeds.

Eradication.—Avoid sowing the seed. It is not troublesome on well-kept farms where good cultivation is given and crop rotation is followed.

Cow Cockle (*Saponaria vaccaria* L.)

Other common names.—Cow-herb, cow basil, cockle, and china cockle.

Description.—Cow cockle is an annual plant which was introduced from Europe and is a very close relative to the ordinary corn cockle so common in this State. This plant grows from one to three feet high. The leaves are very smooth and succulent. The blossoms appear in July and seeds are ripe in August. The pale red and rather showy flowers are often an inch broad, although their average width is only about half an inch. The seeds are produced in a five-angled pod. They are dull black in color, slightly roughened, and almost spherical. Cow cockle seeds are often found in the seeds of the

Fig. 9. Cow Cockle

1 Top of plant; 2 seedling; 3 seedling somewhat older; 4 root system; 5 flower; 6 capsule containing seeds; 7 seed natural size and enlarged.

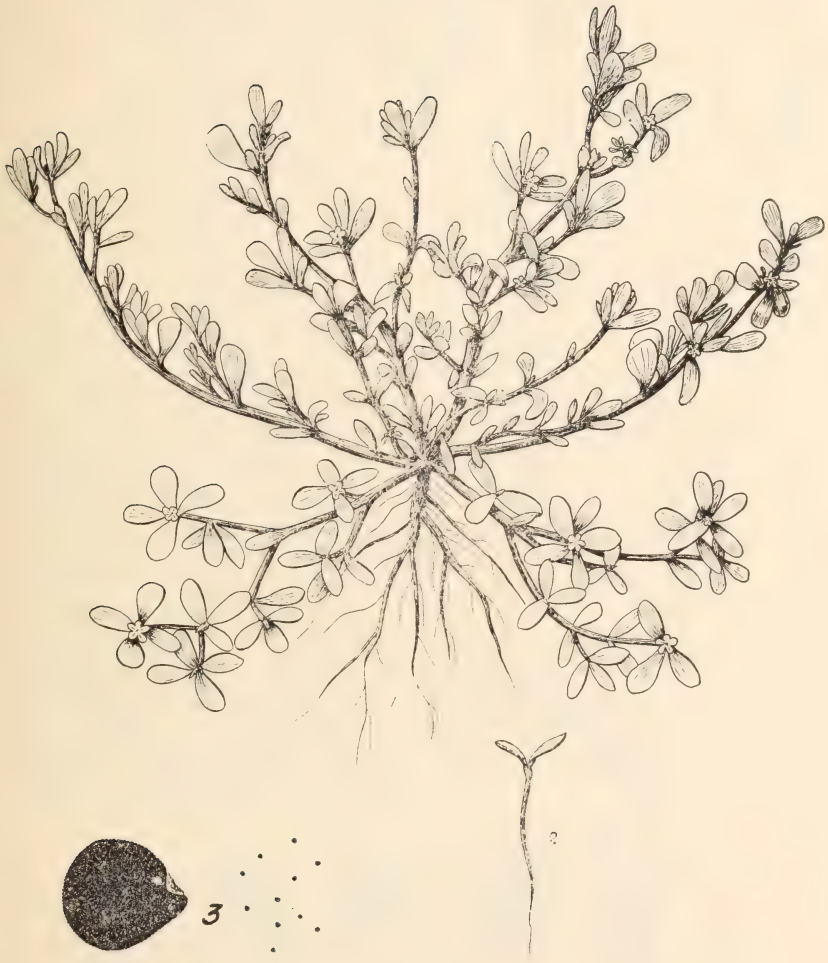

Fig. 10. Purslane

1 Entire plant; 2 seedling; 3 seed natural size and enlarged.

Fig. 11. False Flax

1 Top of plant; 2 seedling; 3 root system; 4 seed natural size and enlarged.

different cereals. This plant is becoming more common in the State each year.

Eradication.—Cow cockle can easily be kept in check by sowing clean seed. The seeds are small and easily screened out of seed grain. Stray plants should be destroyed before the seeds mature.

Purslane (*Portulaca oleracea* L.)

Other common names.—Garden purslane, pursley, wild portulaca, and pusley.

Description.—Purslane is an annual weed. It is very spreading in its habit of growth and is almost always found prostrate on the ground. It branches freely, the branches coming from a central root and extending in every direction. This is a very fleshy plant, the leaves and stems containing so much moisture that the seeds often ripen even after the plant is detached from the soil. The inconspicuous, yellow flowers begin to form during the latter part of June, but the plant keeps on flowering and produces seeds during nearly the entire season. The small, black, kidney-shaped seeds are produced in a pod which breaks open when the fruit is mature. They are very finely marked but the markings can not be seen without the aid of a magnifying glass. Purslane is scattered chiefly by seeds, although sometimes small roots are sent out at the joints. It is very often considered a bad weed in the garden.

Eradication.—Frequent hoeing, preferably when the plants are young, will prove effective. If nearly mature they should be removed from the field or garden and burned if possible. The plant seeds freely and is very persistent but can be eradicated by prompt and constant attention for a season.

False Flax (*Camelina sativa* L.)

Other common names.—American false flax, Dutch flax, oilseed plant, Siberian oilseed, jack flax, cheat, and madwort.

Description.—False flax belongs to the mustard family and is either an annual or winter annual. It was introduced from Europe and is found particularly in flax fields, also in other cultivated fields and waste places. The plant has one central root, from which grow several upright, leafy side branches. It grows from about one to three feet high, bears small yellow flowers from June to August, and matures seeds from July to September. The seed pods are about a quarter of an inch long and somewhat oblong in shape. The seeds

Fig. 12. Black Mustard

1 Top of plant; 2 seedling; 3 seedling somewhat older; 4 single leaf; 5 seed natural size and enlarged.

are quite variable in shape and size. They are slightly flattened on one side with a deep groove on the opposite side. The color of the seed is reddish yellow. The seed of false flax is found most commonly in the seed of ordinary cultivated flax.

Eradication.—If false flax is found thinly in grain or flax fields, pull it out by hand. Where the land is badly infested, give surface cultivation in the fall and spring. If an early crop can be removed, fallowing for the balance of the season will give good results. Rotations including grass crops will help in eradicating, if one or two crops of hay can be cut. Sow clean seed.

Black Mustard (*Brassica nigra* L. Koch)

Other common names.—Brown mustard, grocer's mustard, cadlock, kerlock, and warlock.

Description.—Black mustard, an annual weed, is a very close relative to the ordinary wild mustard or charlock which is so common throughout the State, but is not so widely distributed as the latter. The plant is different in many respects. The leaves and stem are smoother, the foliage is darker than that of the other mustards and the plant grows much taller, often reaching a height of seven feet. The plant flowers from June to September, somewhat later than the common mustard, and the seeds are ripe in August. The seed pods are quite short and are more or less four-angled. There are about six almost spherical, red or dark brown seeds in each pod. They are often elongated, and the surface is slightly roughened.

Eradication.—As in the case of other annuals, black mustard should be prevented from seeding. Seed grain should be carefully cleaned so that no mustard seed will be sown. Hand-pulling is effective for stray plants. Frequent cultivation when the plants are young will destroy them in cultivated fields. The methods of eradication advised in Bulletin 129 of this Station for common mustard give good results in combating this weed.

Five-Finger (*Potentilla monspeliensis* L.)

Other common names.—Cinquefoil, Norwegian cinquefoil, upright cinquefoil, and barren strawberry.

Description.—Five-finger belongs to the rose family and may be either annual or biennial. It grows in both dry and moist soil and is found commonly in meadows, cultivated fields, and waste places. It is quite generally distributed throughout the State. It begins

Fig. 13. Five-Finger

1 Top of plant; 2 seedling; 3 seedling somewhat older; 4 separate leaf; 5 seed natural size and enlarged.

flowering the early part of June and flowers and seeds until the latter part of September. The plant is somewhat spreading in its character and often grows quite near the ground. The leaves are three-lobed and not five-lobed as the name would indicate. The plant is quite hairy and sometimes grows to a height of three feet. The yellow flowers are about half an inch broad. The plant is propagated chiefly by its seeds, which are very small, light brown in color, and have a wrinkled surface. They are found chiefly in timothy, lawn grass, and many of the other commercial grasses.

Eradication.—Avoid sowing grass seeds containing seeds of this weed. Destroy the plants by hoeing, cultivating, or cutting before seeds mature. Will yield to clean farming and short rotation schemes in which the grass crops are used for hay and the intertilled crops are thoroughly cultivated.

Wild Rose (Species of *Rosa*)

Other common names.—Sweet briar and eglantine.

Description.—The wild rose is a perennial weed which grows very commonly along roadsides and also in cultivated fields and waste places. The plant flowers during practically the entire summer, and seeds are mature in the early fall. The fruit of the wild rose varies from orange to bright red and is somewhat berry-like in appearance. The seeds are hard and nutlike. The wild rose is quite variable in height, sometimes reaching a height of three or four feet, while at other times it is very low and bushy. There are two common species of the wild rose growing in this State. The large attractive flowers, which are generally borne singly, although sometimes in clusters, range from white to a dark pink or even red. The plant is propagated by seeds and also by running root stalks. The seeds are quite variable in shape and color, the latter being, however, generally a dark brown. They are most commonly found in the seed of wheat, oats, and other cereals. It is sometimes quite difficult to separate the seed from wheat because it is of practically the same size.

Eradication.—The wild rose is one of the troublesome weeds of the prairie section. Its deep, perennial, underground stems make it very persistent. It is especially troublesome where the grain is "stubbled in" without plowing the land. The best remedy is plowing thoroughly with a sharp plow, cutting the entire furrow slice so that all roots will be cut off clean. If the plowing can be done in August or early in September and the land disked several times at intervals of a week or ten days, the roots will almost surely be destroyed.

Fig. 14. Wild Rose

1 Top of plant; 2 separate leaf; 3 seed natural size and enlarged.

Fig. 15. Mallow

1 Top of plant; 2 seedling; 3 seedling somewhat older; 4 separate fruit; 5 seed enlarged.

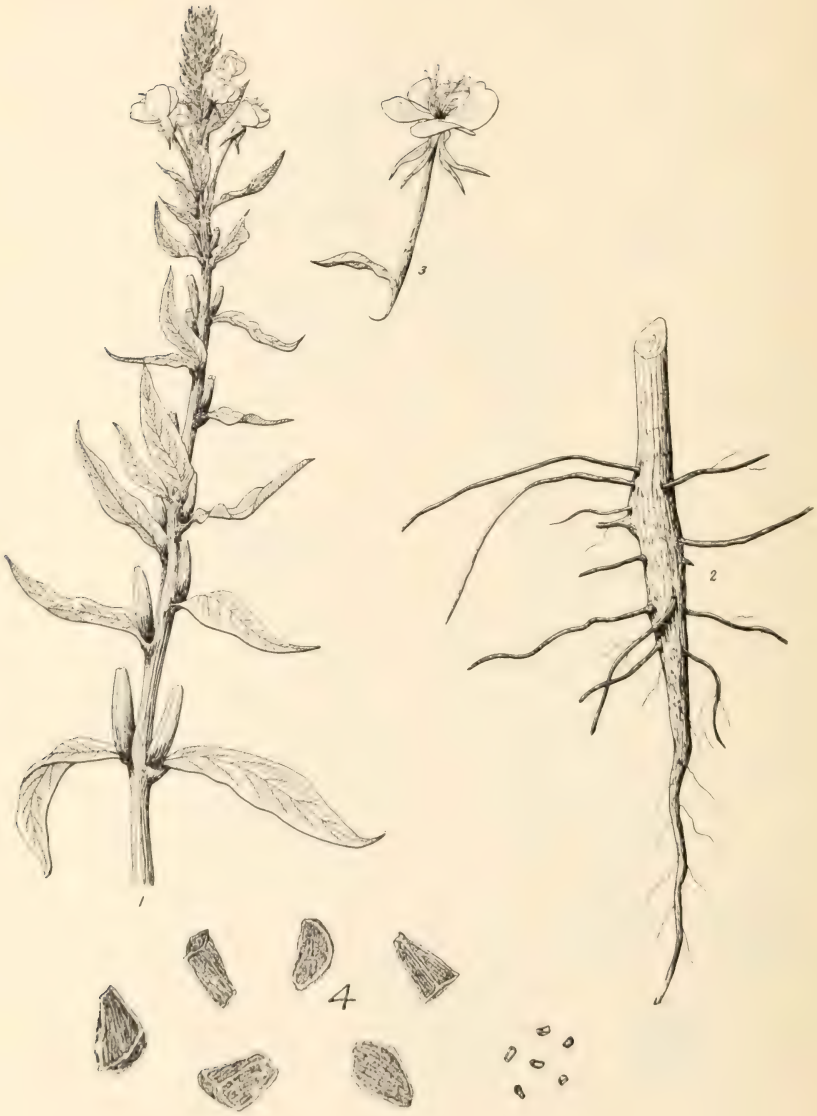

Fig. 16. Evening Primrose

1 Top of plant; 2 root system; 3 single flower; 4 seed natural size and enlarged.

Mallow (*Malva rotundifolia* L.)

Other common names.—Common mallow, low mallow, dwarf mallow, blue mallow, country mallow, running mallow, Dutch cheese, doll cheese, fairy cheese, and cheeses.

Description.—The mallow is an annual, biennial, or even perennial. It is a relative of the hollyhock, which it somewhat resembles, though much smaller in size. It was introduced from Europe but is now commonly found in all parts of this State in waste places, gardens, lawns, and fields. The plant flowers almost throughout the season and matures seeds during the latter part of July. It has a deep tap root from which branch spreading stems that are often thirty inches long. The pale blue, rose-colored, or white flowers are borne in clusters in the axils of the long-stalked, round or heart-shaped leaves. The seeds of this plant are produced in a sort of a circle which has the appearance of a cheese. This accounts for the name, cheeses, which is often given to this plant. The plant is propagated mainly by the seeds, which are very seldom found in commercial seed.

Eradication.—Mallow is a common dooryard weed, but usually not troublesome on cultivated land. It may be destroyed by bringing the land under cultivation or by seeding it thickly to grass.

Evening Primrose (*Onagra biennis* L.)

Other common names.—Common evening primrose, tree primrose, four-o'clock, coffee plant, fever plant, large rampion, and night willow herb.

Description.—The evening primrose is a biennial native of this country. It is found both in waste places and in cultivated fields, as it thrives in either dry or moist soils. The flowers of evening primrose appear in June and the seeds are mature about the last of September. The flowers are particularly attractive, being of a bright yellow color, opening towards the end of the day and closing next morning. Many of them, however, remain open during the day. The flower develops into a long, tapering, four-celled fruit which is somewhat capsular in shape. When the fruit is ripe, this capsule breaks open and the small, dark reddish brown, four-angled seeds are shaken out by the wind. The evening primrose is propagated almost entirely by seeds, which are most commonly found in alsike clover, white clover, blue grass, lawn and other grasses.

Eradication.—When evening primrose appears in meadows or clover fields, the plants should be removed with a spud. In grain

Fig. 17. Dodder

1 Clover attacked by dodder; 2 dodder seedling; 3 young clover plant attacked by dodder; 4 seed natural size and enlarged.

stubble they may be destroyed by fall or spring cultivation. Late summer plowing is also useful in eradicating this weed. Special care should be taken to avoid sowing the seed.

Dodder (Species of *Cuscuta*)

Other common names.—Hail-weed, hairweed, ail-weed, strangle weed, scold-weed, strangle tare, devils-gut, hellweed, and love vine.

Description.—Dodder is an annual weed which is parasitic in its nature. The plant starts from the seed and forms a threadlike branch which winds around some growing plant, sending small parasitic roots into it. The dodder plant then detaches itself from the soil by the dying away of its lower stem, and lives entirely upon the plant which it has attacked. Dodder attacks many different kinds of plants. There are several varieties, two of which grow particularly well on alfalfa, while two attack red clover and one grows on flax. At the present time dodder has not secured a strong foothold in this State but it is quite common in western states and in Europe and great care must be taken in sowing seeds that no dodder is sown. The plant flowers in the middle of the summer and early fall and seeds ripen from the latter part of July to September. The leaves of the plant are so modified that they are very inconspicuous and appear as scales along the sides of the stem. The plant is generally yellow and the seeds are not very large, although the size varies with the variety. For instance, the seeds of the small-seeded alfalfa dodder are very much smaller than those of the large-seeded variety. Dodder seeds are found particularly in the seed of alfalfa, clovers, and flax.

Eradication.—Prevention rather than eradication should be the rule with dodder. A careful examination of the clover and alfalfa seed should be made and any seed that contains dodder seed rejected. If an alfalfa field is badly infested with dodder it should be plowed and put into other crops for a few years. Where alfalfa is grown for hay for two or three years, the original seeds will be exhausted and the dodder eradicated, as the early and frequent cutting will prevent new seeds from forming.

Sticktight (*Lappula lappula* L.)

Other common names.—Stickseed, beggar's lice, European stickseed, bur seed, sheep bur, small sheep bur, and blue bur.

Description.—Sticktight is an annual or winter annual which was introduced from Europe and which has now become quite generally distributed throughout this State. Only recently has this weed been

Fig. 18. Sticktight

1 Top of plant; 2 enlarged section of plant showing where seeds are produced; 3 seedling; 4 seedling somewhat older; 5 seed natural size and enlarged.

Fig. 19. Blue Vervain

1 Top of plant; 2 seed natural size and enlarged.

Fig. 20. Catnip

1 Top of plant; 2 seedling; 3 single flower; 4 seed natural size and enlarged.

found in cultivated fields as it is one which generally grows only in waste places. It thrives best on light, sandy soil. The plant branches profusely and is covered with short, white hairs which give it a grayish appearance. It begins flowering in June and the seeds begin to ripen during the latter part of July. The inconspicuous small blue flowers are borne in leafy, one-sided clusters. The pear-shaped seeds are covered with sharp, hooklike spines, which aid greatly in distribution. Sticktight seeds are sometimes found in clover seed and quite often in alfalfa seed.

Eradication.—Avoid sowing the seed. Cultivate thoroughly. Early summer fallowing is recommended if the land is badly infested.

Blue Vervain (*Verbena hastata* L.)

Other common names.—Wild hyssop, American vervain, purvain, blue American vervain, iron weed, and false vervain.

Description.—Blue vervain is a persistent, deep-rooted perennial weed common in this State. It is particularly fond of moist soil and grows commonly in waste places, in pastures, along roadsides, and sometimes even in cultivated fields. The stem of this plant is erect, nearly square, usually branched, and from three to seven feet high. Although not very injurious, this weed becomes very unsightly in pastures and along roadsides, especially when the leaves are covered with mildew. This plant flowers practically all summer and the light blue flowers are borne in slender heads, the flowers appearing first at the base of these heads and gradually working up. The plant is propagated entirely by brown, club-shaped seeds which are very often found in commercial seeds, such as timothy, red clover, lawn-grass mixtures, and other grasses. There are four different species of vervain growing in this State, but the blue vervain is the most common.

Eradication.—Remove blue vervain by spudding out or cutting with a sharp hoe or spade. It is not troublesome on well-cultivated land.

Catnip (*Nepeta cataria* L.)

Other common names.—Catnep and common catmint.

Description.—Catnip is a perennial weed introduced from Europe and now quite common throughout the State, especially near dwellings, and in barnyards and gardens, but it is not considered troublesome in cultivated fields. The plant belongs to the mint family and

Fig. 21. Buckhorn Plantain

1 Entire plant; 2 seedling; 3 seedling somewhat older; 4 seed natural size and enlarged.

has a square, leafy stem. In olden times the leaves of catnip were used for catnip tea which was supposed to be a remedy for practically all children's ailments. Cats are very fond of the leaves of this plant. The flowers are borne at the summit of the main stem and are pale purple in color. The reddish brown seeds are quite small and very seldom appear in commercial seeds.

Eradication.—Dig out with a spade or hoe.

Buckhorn Plantain (*Plantago lanceolata* L.)

Other common names.—English plantain, buck plantain, long-leaved plantain, ripple plantain, snake plantain, long plantain, dog's-ribs, black-jacks, rams'-tongue, rib-grass, ribwort, and rat-tail.

Description.—Buckhorn plantain is usually perennial, although sometimes biennial. This plant, which was introduced from Europe, has become very common in the southern states but has only recently worked its way into this State. It very often secures a foothold in clover fields and crowds out the clover plants. The flowers appear throughout the summer and the seeds mature about August 1. This plant is a close relative to the common plantain which grows abundantly in lawns and waste places. The leaves of the buckhorn plantain are long and narrow and they all come from a common point at the top of the root. The flowering head is short and clublike. The flowers are yellow in color. Buckhorn plantain propagates itself almost entirely by seeds, which are distributed in hay and in the seeds of crops. These seeds are chestnut-brown in color and highly polished. They are boat-shaped and rounded at each end, one face of the seed is rounded, while the other face is flattened and has a deep groove. The seeds of buckhorn plantain are found especially in the seeds of the clovers and grasses. On account of the size of the seed it is very hard to clean buckhorn plantain from red clover seed.

Eradication.—Stray plants in a lawn may be spudded out. Fields badly infested must be plowed, cultivated, and resown. Grass seed containing buckhorn should not be sown. It is important that all grass seed be inspected for purity as this is a dangerous weed.

Marsh Elder (*Iva xanthiifolia* Nutt)

Other common names.—Highwater shrub and false ragweed.

Description.—Marsh elder is an annual weed with a very simple root system. This weed is especially common in the central and southern parts of this State but is not a very serious pest. It is

Fig. 22. Marsh Elder

1 Top of plant; 2 seedling; 3 seedling somewhat older; 4 seed natural size and enlarged.

Fig. 23. Mayweed

1 Top of plant; 2 root system; 3 seedling; 4 seedling somewhat older; 5 seed natural size and enlarged.

Fig. 24. Prickly Lettuce

1 Section of plant showing leaf arrangement; 2 top of plant; 3 seedling; 4 seedling somewhat older; 5 seed natural size and enlarged.

found particularly in waste places, along roadsides, and in cultivated fields, especially grain and hay fields. This is a very coarse plant, greatly resembling the kinghead in general appearance. The plant reaches a height of from three to eight feet, the stem is much branched, and the broad leaves have a grayish tinge. Large numbers of grayish black, elongated, somewhat heart-shaped seeds are produced.

Eradication.—Prevent the plants from going to seed by cutting or pulling. Marsh elder may easily be held in check by clean farming.

Mayweed (*Anthemis cotula* L.)

Other common names.—Dog's camomile, fetid camomile, dill weed, madders, mawther, dog fennel, hog's fennel, dog-finkle, dog daisy, stinking camomile, and stinking mayweed.

Description.—Mayweed is an annual or sometimes a winter annual which grows in waste places, around old buildings, and on uncultivated lands. It is particularly abundant in old settlements. It grows in nearly all kinds of soil and is quite generally distributed throughout the State, but is not considered a very serious weed pest. The plant flowers in late summer and early autumn and some seeds are mature in the latter part of August. The leaves of the plant are very finely divided and have a quite prominent and disagreeable odor. The flowering heads are white and sometimes about an inch broad. The center of the head is yellow and the flower is very similar to the yellow-eyed daisy. The plant is propagated entirely by very small and inconspicuous seeds which are often found in lawn-grass mixtures and also in the seeds of some of the clovers.

Eradication.—Avoid sowing the seed. Pull stray plants in meadows and pastures. Cut the plants that grow in fence corners and lanes before they go to seed. Keep the land fully occupied by grass crops. Clean cultivation will prevent mayweed from becoming established in fields and garden.

Prickly Lettuce (*Lactuca scariola* L.)

Other common names.—Milk thistle, wild lettuce, English thistle, compass plant, and horse thistle.

Description.—Prickly lettuce is an annual or biennial plant, from which common garden lettuce is thought to have originated. It was introduced from Europe about fifty years ago and is now very common throughout the State in meadows, cultivated fields, along roadsides, and in waste places. It seems to thrive well in any kind of

Fig. 25. Perennial Sow Thistle

1 Underground system of plant; 2 top of plant showing flowering head; 3 seedling; 4 seed natural size and enlarged.

soil. The plant grows from two to five feet high and contains a milky juice which can readily be seen by breaking the stem or the leaf. As the leaves tend to turn one edge toward the sun, the plant is sometimes called the compass plant. The plant begins flowering in July and continues until frost. The yellow flowering heads are borne on slender stalks. The seeds are ripe in the fall, are dark gray, almost black in color, and resemble very closely those of the dark-seeded varieties of the common lettuce. A tuft of hairs is attached at one end of the seed which aids in distribution. The seed of prickly lettuce is very seldom found in commercial seed.

Eradication.—Prickly lettuce causes very little trouble in well-cultivated fields. Destroy stray plants with a hoe or spade, making sure to get beneath the crown. Clean cultivation and full seeding in waste places will occupy the land and keep out the weed.

Perennial Sow Thistle (*Sonchus arvensis* L.)

Other common names.—Corn sow thistle, milk thistle, swine thistle, tree sow thistle, field sow thistle, and creeping sow thistle.

Description.—Perennial sow thistle is one of the worst weeds in the State. It is, at the present time, more or less confined to the northwestern part of the State but it is, however, rapidly working southward. The plant is very common in waste places, along roadsides, and in cultivated fields. It seems to thrive best in rich soil. The plant flowers from June to August and matures seeds from July to September. The plant ranges from two to four feet in height. The stems are more or less hollow and are filled with a milky, bitter juice which often gives it its name, milk thistle. There are two other varieties of sow thistle quite common in the State. These are annual varieties and are not considered bad weeds. These annual sow thistles can readily be distinguished from the perennial by the fact that they do not have the thick, creeping underground root stalks which characterize the perennial sow thistle.

The bright yellow flowers of the perennial sow thistle are clustered together in a composite head which is from one to two inches across. Many oblong, dark brown seeds are produced from each head. Their surface is longitudinally ribbed and, when mature, they have a dense tuft of hairs attached which aids in distribution as the wind is thus enabled to carry them. In spite of the great number of seeds produced, the most common mode of propagation is by underground root stalks. The seed of the perennial sow thistle is very seldom found

in commercial seed but has been found in blue-grass seed and in lawn-grass mixtures.

Eradication.—When the first stray plants appear they should be pulled or spudded out, before they mature seeds. Constant watchfulness is necessary to detect them. When a field has become so badly infested that the thistles interfere with crop growth, early summer fallowing is advisable. Short rotations should be followed in sections where the weed is very common. A three-year rotation of (1) grain, (2) clover, and (3) a cultivated crop; thorough preparation of the land; and clean cultivation will keep the weed in check.

The specific treatment that follows will give good results where the weed has become well established. Immediately after the removal of the grain crop, plow the land deeply, preferably early in August. After plowing, disk frequently enough to keep the leaves from starting. The disking should be kept up until frost stops the growth of the plants. Start disking early in the spring or replow fairly early. Cultivate the land frequently until about June 1 and plant thickly to fodder or ensilage corn in rows from three to three and one-half feet apart. Cultivate the corn frequently until it shades the ground completely. Hand hoe if necessary. Remove the corn by September 15, plow the land, and sow immediately fall rye. In the spring sow clover in the rye and harrow. The following year cut the first crop of hay and plow under the second. Plant corn the next year and work into a short rotation. Where cultivated crops can not be grown successfully or can not be used, buckwheat, following early summer fallow, may be grown quite satisfactorily for smothering out the thistles. Vigilance, prompt and thorough cultivation, and short rotations are necessary in the eradication of sow thistles.

SUMMARY OF INFORMATION FOR USE IN THE RECOGNITION OF THE WEEDS DESCRIBED IN THIS BULLETIN

Name	Class	Color of		Found in
		Flower	Seed	
1. Crab grass	Annual	Green and purple	Gray and purple	Lawn grass, blue grass, and other grasses
2. Witch grass	Annual	Green	Leaden gray or straw color	Lawn grass and other grasses
3. Barnyard grass	Annual	Green or purple	Yellowish gray	Clovers and grasses
4. Darnel	Annual	Green	Gray	Wheat and other cereals
5. Pennsylvania smartweed	Annual	Dark pink	Shiny black or brown	Clovers and cereals
6. Wild buckwheat	Annual	Green	Dull black	Clovers and cereals
7. Night-flowering catchfly	Annual and winter annual	Creamy white	Dull gray	Alsike and white clover
8. Cow cockle	Annual	Pale red	Dull black	Cereals
9. Purslane	Annual	Yellow	Black	Kentucky blue grass
10. False flax	Annual and winter annual	Yellow	Yellow	Flax
11. Black mustard	Annual	Yellow	Reddish brown	Clovers
12. Five-finger	Annual or biennial	Yellow	Straw color	Timothy, blue grass, and redtop
13. Wild rose	Perennial	Pink to red	Light brown	Cereals
14. Mallow	Annual, biennial, or perennial	White to rose color	Gray	Red clover
15. Evening primrose	Biennial	Bright yellow	Dark brown	Timothy and clovers
16. Dodder	Annual	White or yellow	Grayish	Clovers, alfalfa, and flax
17. Sticktight	Annual and winter annual	Blue	Gray	Clovers and alfalfa
18. Blue vervain	Perennial	Blue	Brown	Timothy, clovers, and grass mixtures
19. Catnip	Perennial	Pale purple	Reddish brown	Clovers
20. Buckhorn plantain	Biennial and perennial	Yellow	Chestnut-brown	Red clover and alfalfa
21. Marsh elder	Annual	Greenish	Gray black	Alfalfa and clovers
22. Mayweed	Annual and winter annual	White	Straw color	Timothy and clovers
23. Prickly lettuce	Annual or biennial	Yellow	Gray black	Seldom found in commercial seed
24. Perennial sow thistle	Perennial	Yellow	Dark brown	Seldom found in commercial seed

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BULLETIN 176 JULY 1918

The University of Minnesota

AGRICULTURAL EXPERIMENT STATION

MINNESOTA WEEDS

SERIES III

DESCRIPTIONS AND IDENTIFICATIONS

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MINNESOTA WEEDS, SERIES III

By W. L. Oswald and Andrew Boss

INTRODUCTION

The Seed Laboratory of the Division of Plant Pathology and Botany has prepared four seed cases, each containing the seeds of twenty-four different weeds.[1] This bulletin describes the weeds of seed case Series III (see Figure 1).

Bulletins 129 and 139, describing the weeds whose seeds appear in seed cases I and II, may be obtained by applying to the Office of Pub-

Fig. 1. Minnesota Weed Seed Case Series III

lications, University Farm, St. Paul, Minn. A general discussion of weeds appears in Bulletin 129. In these bulletins the authors have not adhered to a strictly botanical terminology but have used largely the language of the farm and seed trade in order to avoid confusion and to make the bulletin practical for farm use. This is especially true in regard to the term "seed" which is frequently used for structures which are, in the strict botanical sense, fruits.

[1] The seed cases may be obtained from the Seed Laboratory, University Farm, St. Paul, Minn., at cost. Four cases, each containing twenty-four kinds of weed seeds, are now available.

Fig. 2. Blue Joint Grass

INDIVIDUAL WEEDS

Blue Joint Grass (*Agropyron smithii* Rydb.)

Other common names.—Western wheat grass, western couch grass, Colorado bluestem.

Description.—Western wheat grass is a perennial which is very closely related to quack grass, but is not, however, considered a very serious weed pest. It is becoming quite common throughout the state. This grass grows quite abundantly in the western states, especially on alkali soil, and is considered a fairly good forage grass. The leaves are rough and very rigid and have a bluish green color by means of which patches of western wheat grass can usually be readily distinguished from other grasses. It spreads by both seeds and underground stems. The straw-colored seeds, which mature in July and August, are very similar to those of quack grass and can be distinguished only when the seeds are carefully examined under a powerful lens. The seeds of western wheat grass are often found in the commercial brome grass, alfalfa, timothy, and red clover seed.

Eradication.—Western wheat grass is not hard to eradicate and is usually considered a desirable forage plant rather than a weed. It yields readily to cultivation, and cropping the land to grain or cultivated crops will subdue it in nearly all types of soil. Seed formation should, of course, be prevented to avoid reseeding where not wanted.

Nodding Wild Rye (*Elymus canadensis* L.)

Other common names.—Wild rye, lyme grass, bunch grass (British Columbia), rye grass.

Description.—Nodding wild rye is a perennial grass common throughout the state, and grows equally well in sandy, black, or clay soil. It is usually from two to three feet high and has stout nodding spikes from four to six inches long with long, wavy awns. These awns are sometimes injurious to grazing animals, penetrating the ears, eyes, and nostrils. The root system is fibrous and there are no long underground stems. The plant spreads chiefly by its seeds which, however, are seldom found in any commercial seed except that of brome grass, in which it is often found.

Fig. 3. Nodding Wild Rye

Eradication.—Stray plants of nodding wild rye may be pulled and destroyed before seeds set. If a field is badly infested, which is not often, the plants should be cut for hay when first headed out and the land plowed and cropped for a year or two.

Hemp (*Cannabis sativa* L.)

Other common names.—Carl hemp, fimble, callow-grass.

Description.—Hemp is a weed in barnyards, waste places, along roads and river banks, and also in cultivated fields. It is an annual plant from three to ten feet high and is very rough and hairy and strongly scented. The stout upright stem has a tough inner bark containing strong fibers for which the plant is often cultivated. It blossoms from July to September, the seeds ripening from August to November. It is propagated only by seed. The grayish oval seed are fed to caged birds. Hemp seeds are seldom found in commercial seed except oats and then only when the oats are from a hemp-growing district.

Eradication.—Wild hemp is not difficult to eradicate if the plants are prevented from seeding. Cutting the crop often enough to stop the formation of seed is the first step. Plowing waste places and seeding to more desirable crops, thus occupying the land, is the second step. Plowing land that has grown wild hemp and planting a cultivated crop, hoeing where necessary to remove stray plants, is usually most effective.

Common Smartweed (*Polygonum hydropiper* L.)

Other common names.—Water pepper, biting knotweed.

Description.—Smartweed is an annual plant growing in moist or wet locations and is commonly found in barnyards, gardens, and waste places. It flowers from June to September and its time of seeding is from July to November. The leaves are quite narrow and are very acrid and peppery. It grows from ten inches to two feet tall and is light green to reddish in color. This plant spreads only by seeds and is not considered a bad weed pest in this state. The seeds of the common smartweed are dull brownish black in color, more or less three-sided and quite pointed at the apex, and are often found in commercial seed of red clover, alfalfa, millet, timothy, and flax.

Fig. 4. Hemp

Fig. 5. Common Smartweed

Fig. 6. Swamp Dock

Eradication.—Smartweed is not a troublesome weed in well-cultivated fields where the soil is in good condition. It yields readily to cultivation. Mow frequently to prevent seeding. Drain the land if low and wet. Keep the land occupied by other crops.

Swamp Dock (*Rumex verticillatus* L.)

Description.—Swamp dock, like curled dock, is a perennial but is not so widely distributed over the state as curled dock. It always grows in wet, swampy places, flowering from May to July and seeding from August to November. The leaves are narrowly oblong and of a pale greenish color. The lower leaves are often heart-shaped at the base. The plant has a stout grooved stem, and grows from two to five feet high. The reddish brown triangular seeds are very seldom found in commercial seed, appearing occasionally however, in the seed of red clover.

Eradication.—Remove stray plants of swamp dock by spudding or spading out. Drain and subdue the low land or swamps. Plow and crop the land and swamp dock will disappear.

Maple-Leaved Goosefoot (*Chenopodium hybridum* L.)

Description.—Maple-leaved goosefoot is an annual plant, flowering from July to September and seeding from August to November. It grows from two to five feet tall and is found most commonly in woods, thickets, and shady places, altho it is sometimes found along roadsides and in waste places. The thin leaves are small, triangular in shape, and resemble those of the common maple. The seeds resemble those of lamb's quarters, described in Series I,[2] but are larger and more uniform in shape. The seeds are often found in alfalfa, red clover, and timothy, and to some extent in alsike and millet.

[2] Oswald, W. L. and Boss, Andrew. Minnesota weeds series I. Minn. Agr. Exp. Sta. Bull. 129. 1913.

Fig. 7. Maple-Leaved Goosefoot

Eradication.—Cut or pull goosefoot before the seeds form. Keep the land fully occupied with more useful plants. It is not troublesome in well-cultivated fields.

Ball Mustard (*Neslia paniculata* (L) Desv.)

Other common names.—Yellow weed, neslia.

Description.—Ball mustard is generally an annual, altho it sometimes lives for two years. It flowers from June to September, and seeds from July to October. It grows from one to two feet tall and is generally found in grain fields and waste places. Only recently has it been found commonly distributed in this state. The flowers, about one eighth of an inch in diameter, are yellow and the leaves are lance-shaped, somewhat narrowed at the base. The stem leaves are arrow-shaped and clasping. There is generally but one seed in a pod. The seed pods, which cling very closely to the seed, are greenish brown in color and the surface is roughened by a network of veins. Ball mustard propagates only by seeds. The seeds are found most commonly in cereals, altho sometimes in clover and alfalfa seed.

Eradication.—Clean all seed grain thoroly. Disk the stubble in fields badly infested by ball mustard as soon as the crops are removed, to cover seeds and induce germination. Disk again later in the fall and plow. Sow to an early crop such as barley or sixty-day oats. If the mustard still appears in large quantities, cut before seeds form and cure with the barley or oats for hay. If only scattering plants appear, pull by hand, carry from field, and burn. As with other annuals, prevention from seeding will eventually bring eradication. A well-planned crop rotation which provides for one or two years in grass will help keep ball mustard in control.

Indian Mustard (*Brassica juncea* (L) Cosson)

Description.—Indian mustard is an annual or biennial plant and is propagated only by seed. It flowers from May to July and seeds from June to August, growing quite commonly in grain fields and along roadsides. It is very similar to the common mustard, which is widely distributed throughout this state. The pods of the Indian mustard are arranged more symmetrically than those of the common mustard. The plant grows from one to four feet tall and has rather stout but few branches. The bright yellow flowers are about half an

Fig. 8. Ball Mustard

Fig. 9. Indian Mustard

Fig. 10. Tumbling Mustard

inch broad and generally clustered at the top of the plant. The seeds are more or less spherical in shape and are dark reddish brown. The surface of the seed is marked by a network of veins which give it a honeycombed appearance. This, however, is not easily seen except with a magnifying glass. Indian mustard seed is found most commonly in the commercial seed of timothy, millet, red clover, alfalfa, flax, and cereals.

Eradication.—The same methods of eradication as are advised for ball mustard will be effective for Indian mustard.

Tumbling Mustard (*Sisymbrium altissimum* L.)

Other common names.—Tall sisymbrium, tumble mustard, white mustard.

Description.—Tumbling mustard is an annual or winter annual plant which blossoms from June to July and seeds from July until frost. It is most commonly found in grain fields, waste places, and along roadsides, and in some of the western states it is considered a very serious weed pest. It is a fairly bad pest in this state, but not nearly so troublesome as some of the perennial weeds. The plant grows from two to four feet high and is much branched and bushy. As soon as the seeds are ripe, the plant breaks away readily from its roots just above the surface of the soil and is tumbled about by the wind. In rolling along the seeds may be scattered, and in this way it becomes quite widely distributed, as it propagates only by seed. The flowers of the tumbling mustard are pale yellow or cream color and are about one quarter of an inch in diameter. The seed pods are very long and slender, often containing from one hundred to one hundred twenty small brown or greenish yellow seeds. When this plant is very abundant in grain fields it interferes with cutting and elevating in self-binders. The seeds of tumbling mustard are found most commonly in the commercial seed of timothy, white clover, and redtop.

Eradication.—Clean seed grain carefully and prevent any mustard plants from going to seed. Pull stray plants by hand, carry them from the field, and burn them. These weeds usually appear at the edges of fields or where recently burned over but may appear in grain crops. If so, cultivate early in the season with a weeder or light harrow and pull by hand.

Fig. 11. Canada Milk Vetch

Canada Milk Vetch (*Astragalus canadensis* L.)

Other common name.—Canadian rattleweed.

Description.—Canada milk vetch, a perennial plant, grows from one to four feet high. It is propagated most commonly by seeds, which are yellow-green in color and more or less flat and kidney-shaped. It grows particularly well in dry gravelly soil and is often found along streams and in waste places and also in cultivated fields. It blossoms from July to August and seeds from August to November. The flowers are greenish yellow in color, very numerous, and clustered together in dense spikes. The leaves are compound, each being made up of from twenty-one to twenty-seven oblong leaflets. Seeds are occasionally found in the seed of red clover, timothy, and alfalfa.

Eradication.—Destroy the plants of Canada milk vetch before seeds form by mowing, pulling, or hoeing out. If fields are badly infested, plow and plant to a cultivated crop.

Indian Mallow (*Abutilon theophrasti* Medic.)

Other common names.—Velvet leaf, American jute, butter print.

Description.—Indian mallow is not a native plant. It grows particularly well in rich soil and is often found in waste places, farm yards, and vacant city lots. It is an annual weed, flowering from July to October and seeding from August to November. The plant generally grows from three to eight feet high and is very stout and somewhat branched. It has very large velvety, heart-shaped leaves from three to twelve inches broad, and on account of the velvety texture of the leaf the plant is often called velvet leaf. The large deep yellow, five-parted flower afterwards develops into a peculiar fruit made up of from twelve to fifteen hairy carpels with spreading beaks. The kidney-shaped seeds are grayish brown, one eighth of an inch long. They are seldom found in commercial seed.

Eradication.—Prevent seeding. Cut out all growing plants of Indian mallow before seeds mature. Practice good tillage and clean cultivation. Keep waste places occupied with grass or other crops.

Water Hemlock (*Cicuta maculata* L.)

Other common names.—Spotted cowbane, musquash root, beaver poison, muskrat weed, death-of-man, children's bane; also wrongly called water parsnip.

Fig. 12. Indian Mallow

Description.—Water hemlock is a perennial weed which grows almost entirely in wet meadows, marshy places, and along the sides of streams and ponds. The plants grow from three to six feet high. It is one of the few poisonous plants found in Minnesota. The root is particularly poisonous altho it has a pleasant aromatic taste. When it is eaten by cattle, death almost always follows. Persons have also been known to die from eating the root. Water in low places is often made poisonous by cattle crushing the roots. It blooms from July to August and seeds from August to October. The small, white flowers are formed in compound umbrella-like, many-flowered clusters from two to four inches across. Water hemlock is scattered almost entirely by seeds and by offsets from the crown of the root. The seeds are very seldom found in commercial seed.

Eradication.—Because of its poisonous nature and the danger to livestock, water hemlock should be destroyed wherever found. Spud or spade out or pull by hand after a rain, when the ground is soft. Prevent seed forming whenever possible. Drain and cultivate fields that are badly infested. When the fields are plowed and cultivated it is good practice to bring the roots to the surface with a spring-toothed harrow and gather and burn them.

Common Milkweed (*Asclepias syriaca* L.)

Other common names.—Silk weed, swallow-wort, silken cissy, cottonweed.

Description.—Milkweed is a perennial and is quite common throughout the state. It is often considered a very serious weed pest. It is particularly common in fields and pastures and in waste places, but it also often infests cultivated fields. The plant, which grows from two to five feet high, is propagated both by seeds and by root-stalks. The underground root-stalks are often hard to destroy. This makes the weed quite bad in cultivated fields. The opposite leaves are very thick and the under surface is covered with fine hairs. Both leaves and stem contain a thick milky juice. Milkweed flowers between June and August and seeds between August and October. The pinkish flowers are formed in dense nodding clusters and are very fragrant. The flat brown seeds are scattered particularly by the wind, owing to a tuft of fine silken hairs at the end of each seed.

Eradication.—Prevent milkweed from seeding by cutting the plants early. Practice good plowing and clean cultivation, prepare the land well, and make full seedings of all crops. Top-dress pastures and encourage full stands of grass.

Fig. 13. Water Hemlock

Fig. 14. Milkweed

Fig. 15. Hoary Vervain

Hoary Vervain (*Verbena stricta* Vent.)

Other common names.—Wooly vervain, mullein-leaved vervain.

Description.—Hoary vervain is a perennial weed from two to four feet high, which flowers from June to September and seeds from August to November. It is seldom found in cultivated fields but is quite common on dry plains and prairies. The purplish flowers are borne on a dense solitary club-shaped spike between six and twelve inches long. The flowers at the bottom of the spike open first. The oblong reddish-brown seeds are often found in the commercial seed of red clover, timothy, alfalfa, and lawn grass. This plant is spreading slowly by its seeds being carried in hay.

Eradication.—Be careful to sow no grass seed containing seeds of hoary vervain. Cut grass crops early to prevent seeds from maturing. Spud out occasional plants when found.

Wood Sage (*Teucrium canadense* L.)

Other common names.—American germander, ground pine.

Description.—Wood sage is a perennial plant, flowering from June to September, and seeding from August to November. It lives on rich, low grounds, along roadsides, and on the banks of streams. This plant belongs to the Mint family, and grows from one to three feet high. It is not very much branched. It propagates only by seeds. The seeds are ovoid in shape, brown and rough, and are generally found in commercial seeds of timothy, millet, barley, red clover, oats, flax, and white clover.

Eradication.—Avoid sowing grass seed containing weed seeds. Spud out stray plants and plow and subdue badly infested spots.

Dragonhead Mint (*Dracocephalum parviflorum* (Tourn.) L.)

Other common name.—Dragonhead.

Description.—Dragonhead mint grows from four inches to two and one-half feet high. It is either an annual or a biennial and flowers from early June to August. The seeds mature early in the fall. It generally grows in rocky or gravelly soil, and is quite commonly distributed throughout the state. The pinkish white flowers are all crowded in a dense terminal head and the seeds, by means of which

Fig. 16. Wood Sage

Fig. 17. Dragonhead Mint

Fig. 18 Wild Bergamot

the plant is distributed, are black or blackish brown; about twice as long as wide; and three-sided, two sides being flat and the other side curved. They are often found in commercial seed of red clover, timothy, alsike clover, wheat, oats, and alfalfa, and sometimes in flax.

Eradication.—Sow only clean grain. Have grass seed examined for purity before sowing. Pull or spade out all plants.

Wild Bergamot (*Monarda fistulosa* L.)

Other common names.—Oswego tea, horsemint.

Description.—Wild bergamot is a perennial plant generally found in open woods and thickets and on dry rocky hills. It blooms from June to September and seeds from July to October. The plant grows from two to three feet high and has a very distinct aromatic odor. The flowers vary from purplish to yellowish pink, white, and dotted, and are clustered in a solitary head at the end of the branch. Wild bergamot propagates by seed and by division of its roots. The brownish green seeds are seldom found in commercial seed samples.

Eradication.—Wild bergamot is not troublesome in cultivated crops or tilled land. Eradicate by digging out the plants or plowing the land.

Common Plantain (*Plantago major* L.)

Other common names.—Greater plantain, dooryard plantain, birdseed plantain, wayside plantain, broad-leaved plantain, and round-leaf plantain.

Description.—Common plantain is a perennial plant found commonly on lawns, along roadsides, and in waste places. It flowers from May to September and seeds from July to October. The leaves are very broad and quite leathery. The small, white flowers appear in long cylindrical spikes. Plantain reproduces itself by means of seeds which often appear in commercial seed of red clover, timothy, alsike clover, and white clover, and sometimes in redtop and bluegrass.

Eradication.—Meadows infested with plantain should be plowed and thoroly cleaned. A hoed crop or bare fallow gives excellent results. In reseeding the land use only well-cleaned and certified seed.

Lawns that are badly infested should be spaded up, cultivated, heavily manured, and reseeded thickly to pure Kentucky bluegrass and white clover or to any good lawn-grass mixture. Top-dress the lawn

Fig. 19. Common Plantain

frequently and encourage a thick growth of grass. Remove stray plants from the lawn by pulling after a rain or by running a sharp knife deeply under the crown and pulling. Keep the lawn mowed closely and allow no plants to go to seed.

Bracted Plantain (*Plantago aristata* Michx.)

Other common names.—Western buckhorn, bristly buckhorn, and western ripple grass.

Description.—Bracted plantain is an annual or winter annual, and as yet is not very widely distributed throughout the state. The plant is generally found in grass lands, yards, waste places, and on dry prairies, and grows from six to twelve inches high. The leaves are more grass-like than those of the common plantain and on the cylindrical spikes are many sharp-pointed bracts from which it gets its name, bracted plantain. It flowers from May to September and seeds from June to October. The only method of propagation is by seeds which are found in commercial samples of alfalfa and redtop, and to some extent in red clover and timothy.

Eradication.—Sow only grass seed that is free from the seeds of weeds. Prevent plants from going to seed by pulling or removing with a knife. Keep the grass lands fully occupied with grass crops and the lawns richly fertilized.

Gumweed (*Grindelia squarrosa* (Pursh) Dunal.)

Other common names.—Rosin weed, scaly grindelia, gum plant, and tar weed.

Description.—Gumweed is generally a perennial altho it is sometimes a biennial. It is one of the composite group, flowering from June to September and seeding late in the fall. Gumweed is generally found in grain fields, waste places, along roadsides, and in clover and alfalfa fields. It grows from three to four and a half feet high, and is propagated only by seeds, which are blown about easily by the wind. The large terminal flowers are about an inch in diameter and bright yellow in color. The heads are very sticky. The whitish seeds are commonly found in commercial samples of alfalfa and sweet clover, and sometimes in redtop and alsike clover.

Fig. 20. Bracted Plantain

Fig. 21. Gumweed

Fig. 22. Beggar-Tick

Eradication.—Good plowing and clean tillage will hold gumweed in check in tillable land. Sow only pure grass seed and well-cleaned grain. Pull or dig out all plants found growing in the fields or by the roadside before they go to seed.

Beggar-Tick (*Bidens frondosa* L.)

Other common names.—Sticktight, small bur-marigold, devils bootjack, pitchfork weed, and beggar-lice.

Description.—Beggar-tick is an annual plant, flowering from July to September and seeding from August to October. It grows most commonly in moist soil, in gardens, fields, along roadsides, and in waste places. The plant grows from two to five feet high. It is propagated by seed only. The yellow flower heads are about half an inch in diameter and are not very conspicuous. The wedge-shaped brown seeds are much flattened and generally have two awns. These awns are barbed and by clinging to the fur of animals and the clothing of men aid greatly in distributing the seed. They are seldom found in commercial seed.

Eradication.—Beggar-tick may be eradicated by preventing all plants from going to seed. Planting cultivated crops, with hand hoeing and pulling stray plants wherever found will keep it in check. Sow no grain or grass seed containing seeds of beggar-tick.

Roadside Thistle (*Cirsium discolor* (Muhl.) Spreng.)

Other common names.—Field thistle and plumed thistle.

Description.—The roadside thistle is one of the perennial thistles, altho it is sometimes a biennial. It is not considered so bad a weed as some of the other thistles. It flowers from July to November, and seeds late in the fall. It is generally found in fields, along roadsides, and in meadows and pastures. The leaves are deeply cut and are covered with spines and hairs. This thistle is not so prickly as most of the thistles. It grows from two to seven feet high and spreads by means of seeds, which are easily carried by the wind. The purplish flower-heads are from one and a half to two inches in diameter, and are generally solitary at the end of the branches. The seeds of roadside thistle are sometimes found in commercial samples of timothy, red clover, and alfalfa.

Fig. 23. Roadside Thistle

Eradication.—Spud out, pull, or otherwise destroy all thistles before seeds mature. Plow and cultivate fields that are badly infested and follow by a cultivated crop. Hoe by hand if necessary. Sow no seed containing seed of this plant.

Black-eyed Susan (*Rudbeckia hirta* L.)

Other common names.—Brown-eyed Susan, hairy cone-flower, yellow or ox-eye daisy, niggerhead, orange daisy, English bull's eye, and brown daisy.

Description.—Black-eyed Susan is a biennial, flowering from June to October and seeding from July to November. It generally grows on prairies, meadows, pastures, and in waste places, and is from one to three feet high. The flower heads are from two to four inches in diameter, and are solitary on long hairy stems. The center of the flower is dark purplish brown, and the ray flowers are orange-yellow. The plant is propagated by seeds which are often found in commercial samples of timothy, red clover, and alsike clover.

Eradication.—Black-eyed Susan is not a troublesome weed and yields to cultivation. Mowing each year before the seeds ripen will prevent reseeding.

Dandelion (*Taraxacum officinale* Weber.)

Other common names.—Blow-ball, lion's tooth, peasant's clock, doon-head clock, yellow gowan, priest's crown, Irish daisy, monk's head.

Description.—The dandelion is a perennial weed very commonly found on lawns and in waste places. It flowers from very early spring until freezing time, generally seeding about two weeks after flowering. It is one of the worst weeds found on the lawn. The leaves are spread on the ground in a flat rosette, making them hard to cut with the lawn mower. The young plants are excellent for greens in the spring, and the plant is also used medicinally. It has large yellow heads which open in fair weather and close on dark days. The light brown seeds are easily distributed by the wind, and are often found in lawn-grass mixtures, Kentucky bluegrass, and timothy seed.

Eradication.—The full occupation of the land with desirable grasses and crops will hold the dandelion in check in meadows and fields. It is most troublesome on lawns, since it seeds freely and the seeds blow

Fig. 24. Black-eyed Susan

Fig. 25. Dandelion

about readily, thus reinfesting lawns that have been cleaned. The surest remedy against dandelions in the lawn is a rich soil frequently top-dressed with well-rotted manure or a nitrate of soda fertilizer. Such a soil thickly seeded to a mixture of Kentucky bluegrass, redtop and white clover will grow a thick turf that will be troubled but little by dandelions.

If a lawn is only thinly infested, spudding or digging out with a knife is often resorted to. Where badly infested, persistent spraying with sulphate of iron will hold them in check, altho it seldom results in complete eradication because the dandelion has become so universally established as to be quickly reseeded.

In spraying with iron sulphate it is best to make the application two or three days after the lawn has been cut. Spray on bright sunny days just after rather than just before a rain. A heavy rain will wash off the sulphate before the leaves are affected. Spraying at intervals of three or four weeks through an entire season is necessary to kill all of the dandelions. The solution for spraying should be composed of 1½ pounds of iron sulphate to 1 gallon of water. A compressed-air pump with a nozzle that will throw a fine spray is best. It should be tight enough not to leak. The solution will discolor clothing and cement work, so care must be used in applying it.

Name	Class	Color of		Found in
		Flower	Seed	
1. Western wheat grass	Perennial	Green	Straw color	Red clover, bromus, alfalfa
2. Nodding wild rye	Perennial	Green	Straw color	Bromus
3. Hemp	Annual	Green	Gray-brown	Rarely occurs
4. Common smartweed	Annual	Green and pink	Brown	Timothy, flax, and red clover
5. Swamp dock	Perennial	Green	Light brown	Rarely occurs
6. Maple-leaved goosefoot	Annual	Green	Dark gray	Red clover and timothy
7. Ball mustard	Annual or biennial	Yellow	Straw color	All cereals
8. Indian mustard	Annual or biennial	Yellow	Reddish brown	All cereals and most forage crops
9. Tumbling mustard	Annual or winter annual	Light yellow	Light yellow to green	Timothy, alsike, and redtop
10. Canada milk vetch	Perennial	Greenish yellow	Deep yellow	Timothy
11. Indian mallow	Annual	Deep yellow	Grayish brown	Rarely occurs
12. Water hemlock	Perennial	White	Straw color	Timothy
13. Common milkweed	Perennial	Pink	Brown	Never found in crop seeds
14. Hoary vervain	Perennial	Purple	Brown	Timothy and red clover
15. Wood sage	Perennial	Light purple	Brown	Timothy, red clover, and cereals
16. Dragonhead mint	Annual or biennial	White and pink	Gray-brown	Timothy, red clover, occasionally in cereals
17. Wild bergamot	Perennial	Purple	Brown	Rarely occurs
18. Common plantain	Perennial	Pale green	Brown	Timothy, alsike, red clover, redtop
19. Bracted plantain	Annual or winter annual	Pale green	Light brown	Alfalfa
20. Gumweed	Biennial or perennial	Bright yellow	Cream color	Alfalfa
21. Beggar-tick	Annual	Yellow	Dark brown	Rarely occurs
22. Roadside thistle	Perennial	Purple	Tan with yellow tip	Timothy, red clover, cereals
23. Black-eyed Susan	Biennial	Deep yellow, dark center	Black	Lawn grass, timothy, and alsike
24. Dandelion	Perennial	Yellow	Light brown	Lawn grass